THE PREHISTORIC SINAGUA:
THE VIEW FROM ELDEN MOUNTAIN

By
Warren R. DeBoer

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The efforts of many have gone into this report. As is customary, however, I am responsible for any misrepresentations or avoidable shortcomings.

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December 1979

INTRODUCTION

The following report is organized into three sequent parts. The first develops a model designed to specify expected patterning in the archeological record of the Elden Mountain area, Flagstaff, Arizona. The second presents archeological evidence pertinent to the testing of this model. In the third, the model is evaluated and amended on the basis of the "fit" between prediction and observation. This format, however faithfully it may adhere to the canons of scientific method, effectively conceals the actual history of discovery. A few words on this history are in order.

During the summers of 1973 and 1974, a Queens College archeological field school conducted extensive excavations at NA10754, a Sinagua settlement situated at the base of Elden Mountain, immediately north of Flagstaff. This work provided new and important information on a community dating to the tenth and eleventh centuries of the Rio de Flag phase, a poorly understood period in the local Sinagua cultural chronology (Fish and Ryan, 1973; DeBoer, 1976). It is clear that by focusing on one site, this work was essentially uninformative as to the settlement system of which NA10754 was but a small part. Nor was it useful in shedding light on changing patterns of human utilization of the Elden Mountain area through time. In short, although certain general comparisons could be made with the large literature on Sinagua prehistory, NA10754 lacked an adequately defined local context, and as Wilden (1972:11) reminds us, "information without context is noise."

In the summer of 1977, I returned to Flagstaff with a crew of Queens College students in order to pursue the task of providing such a context. Our approach was conventional and involved an intensive archeological survey of the southern and eastern flanks of Elden Mountain. In hindsight, the survey should have preceded and motivated the excavations. For this reversal, I can only point out that by 1977 NA10754 was largely destroyed, a victim of an expanding housing development.

The area surveyed encompasses about 2.3 square miles arranged in a crescent around the southern and eastern base of Elden Mountain, a 9000' high outlier of the San Francisco Peaks (Figure 1). This area, delineated by Flagstaff and Route 89 on one side and by the steep rocky base of Elden Mountain on the other, was small enough to be readily surveyed within the five-week period of study. Several factors, both practical and problem-oriented, governed the selection of this area.

To begin with, prior archeological work (Colton 1920, 1932b, 1946) indicated that the alluvial deposits skirting the base of Elden Mountain were densely settled during Rio de Flag phase times. Later settlements, perhaps the best known of which is Elden Pueblo (Fewkes 1926, 1927; Kelly 1970), are also present. The survey area thus promised to yield a rich body of data which would provide a spatial and temporal context for NA10754 on the one hand and, on a more general level, a local framework for Sinagua cultural development. There was also the practical consideration that the survey area rested on lands of the Coconino National Forest, thus avoiding the difficutly of obtaining permission to work from several different property owners. In addition, our survey plans fit in well with the long-term project of archeological research coordinated by Peter Pilles. Ultimately this research will furnish a much larger areal context for the Queens College survey data.

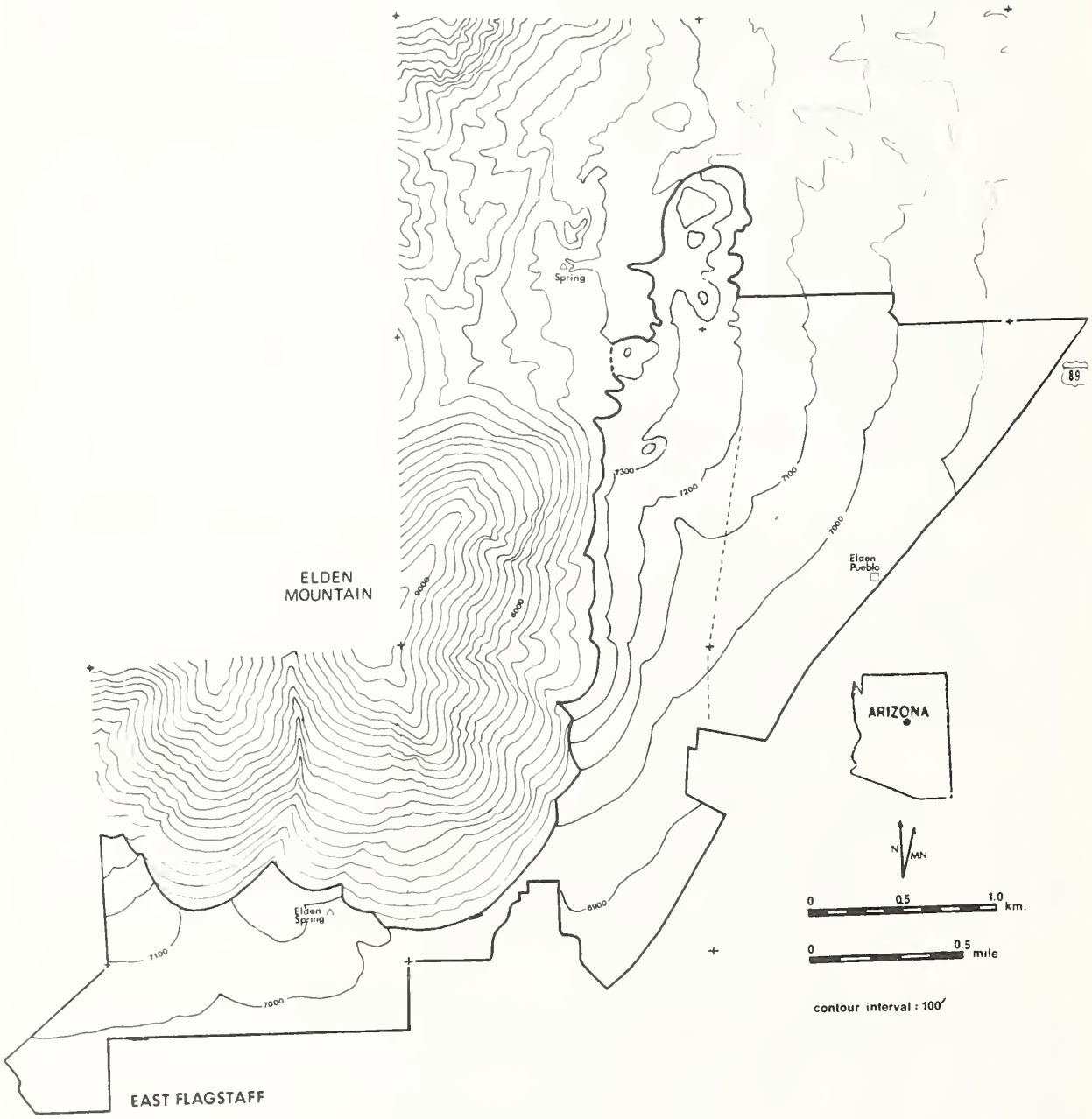


Figure 1. Map of survey area (bordered by heavy line) curling around the base of Elden Mountain. Base map from U.S.G.S. quadrangles for Flagstaff East and Sunset Crater West.

We approached the survey with several linked questions in mind, some raised by the work at NA10754, some of a more general nature. Based on their discoveries at NA10754, Fish and Ryan (1973) suggested that one important Sinagua land use pattern involved the construction of check dams across the numerous gullies which cut through the alluvial fans at the base of Elden Mountain. Such check dams provide small terraces of arable, moisture-laden soil and may also retard erosion. One goal of the survey was to determine the frequency and distribution of these and any other water-management devices (Breternitz 1957b; Berlin et al. 1977) geared to the exploitation of a semi-arid region always risky for agriculture. Another issue stemming from the NA10754 work was the role of hunting in Sinagua subsistence. The virtual absence of faunal remains and the paucity of hunting implements at NA10754 (DeBoer 1976) suggested that hunting was either a minor activity or that its traces were restricted to specialized hunting camps. It was hoped that such camps might be identified in the survey.

More general issues addressed by the survey included the effects that the eruption of Sunset Crater, a critical datum in Sinagua prehistory, had on the survey area. According to the hypothesis first elaborated by Colton (1936), the Flagstaff area witnessed a dramatic population increase after this eruption, an event now dated to about A.D. 1066 (Breternitz 1967). The volcanic ash deposited by the eruption is thought to have acted as a water-conserving mulch and to have attracted farming peoples to the Flagstaff region from many parts of Arizona. Recently Pilles (1977a, 1977b) has questioned this conventional interpretation. While acknowledging an increase in the number of sites following the eruption, Pilles points out that many of these sites are specialized field houses located near pockets of ash, a factor which obviously must be considered in estimating prehistoric population size from settlement data. The survey area, although not directly affected by the ash fall, should be relatable to these regional trends. It is conceivable, for instance, that the survey area may have actually experienced a population decline following the eruption, a decline reflecting a shift in settlement location away from Elden Mountain to areas more directly influenced by the ash fall.

Another issue was the effect that past climatic changes may have had on the occupation of the survey area. The area is currently covered by a belt of ponderosa pine forest. Pollen evidence recently marshalled by Hevly et al. (1977) and Euler et al. (1979), however, indicates that climatic and vegetational conditions differed significantly in the past. As the survey area, straddling the 7100' contour line, approaches the elevational frontiers of maize cultivation, minor climatic changes, particularly as expressed in length of growing season, could have had a major impact on the use of the area by prehistoric farmers. It was thought that the survey data could illuminate correlations between the cultural and climatic evidence.

As our survey proceeded, information germane to the above issues was forthcoming, but new questions and unanticipated patterns also became apparent. In some cases, these new questions surpassed the old in both interest and significance. The interplay between expectation and observation eventually led to the model sketched in the following section. As it

was not developed at the time of the survey, it is a "predictive" or "retrodictive" model only in the context of a confirmation procedure designed to convey the survey results in a coherent and meaningful manner. As survey, like excavation, often yields information not clearly relatable to the problem at hand, we include in the following presentation numerous data, the significance of which is not yet obvious. The model, however, governs which evidence is high-lighted.

EXPECTATIONS

We begin with an observation made by Hack in his classic examination of Hopi agriculture:

> As in many other arid regions altitude governs both precipitation and temperature. The mean annual temperature decreases, and the mean annual precipitation increases with altitude in so regular a manner that for any one latitude precipitation and temperature can be predicted with some assurance by knowing the altitude. (1942:7)

The relevance of this observation to prehistoric farming is clear. As the altitude of farms increases, precipitation for crops becomes more abundant while temperature, as reflected in the more meaningful measure of length of growing season, decreases. These relationships can be readily illustrated with data from the Flagstaff region (Figure 2). In both the cases of mean annual precipitation and of mean annual growing season, a clear and highly significant linear relationship with altitude is evident.

As suggested earlier, the Flagstaff area is marginal for agriculture. For the survey area, extending from 6900' to 7300', the mean length of growing season is currently about 116 consecutive frost-free days, somewhat above the minimal mean growing season of 110 days needed for profitable maize cultivation (e.g., Schoenwetter and Eddy 1964:120). More significant, however, is the marked annual variation in growing season length. For instance, over the period 1899-1934, the range for Flagstaff was 86 to 151 consecutive frost-free days with a standard deviation of 16 days (U.S.D.A. 1941). This variability means that significant crop loss to early or late frosts is always a major risk (Figure 3).

In contrast, the mean annual precipitation for Flagstaff of about 19" is moderately high by Southwestern standards. Again, however, great variation is typical. For the period 1899-1955, the range extended from about 12" to 34" with a standard deviation of 4.6". For successful maize cultivation, about 8" of warm season (June to September for Flagstaff) precipitation is required (Hevly, et al., 1977). The Flagstaff figure of 8.1" barely tops this requirement. Nevertheless, precipitation can be considered less a constraining factor than growing season length for prehistoric farming. The reasons for this involve the comparative ease with which moisture availability, unlike growing season length, can be modified by such cultural means as irrigation, other water management devices such as checkdams, and careful selection of farm sites having favorable soils or contexts within the local watershed.

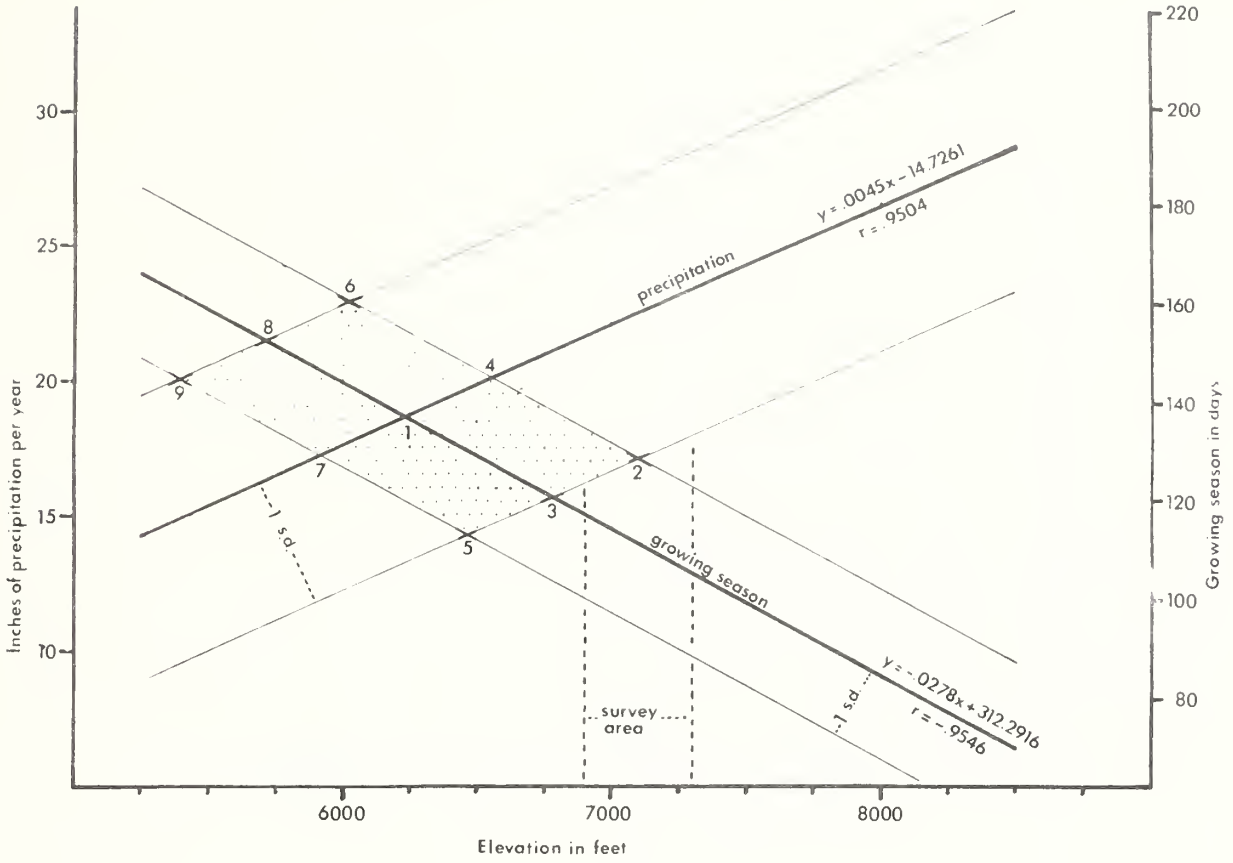


Figure 2. Linear regressions for mean annual precipitation and mean annual growing season length against elevation for stations in northern Arizona; data taken from Colton (1958) and U.S.D.A. (1941); 1 indicates the intersection of the two regression lines under current precipitation and growing season conditions; other numbered intersections (2, 3, 4, etc.) are ranked according to the relative favorability for farming in the survey area, given various altered conditions of precipitation and growing season length.

The two factors of growing season and precipitation are basic ones and must have entered the prehistoric decisionmaking processes which led to the placement of fields and settlements. We can now translate this observation into a simple model for human occupation of the survey area. To do this, we turn to the evidence for past climatic change.

As mentioned earlier, Hevly et al. (1977) have proposed a prehistoric climatic chronology for the Flagstaff area. The major evidence on which this chronology is based consists of the fluctuating representation of arboreal pollen types in pollen samples from Elden Pueblo and other archeological sites in the vicinity of Flagstaff. The way in which climatic interpretations are derived from this evidence is given in Hevly's article and will not be reviewed here. The derived chronology, as outlined in

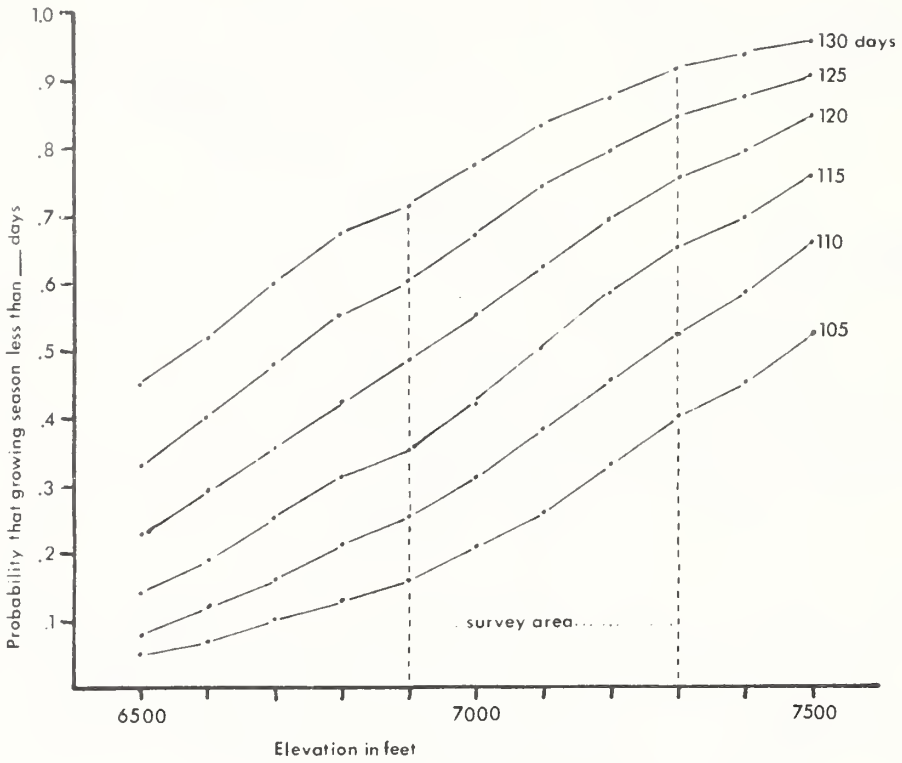


Figure 3. Probability under current conditions that growing season length will be less than the specified number of days.

Figure 4, consists of periods defined in terms of three dichotomous features: (1) relatively wet or dry; (2) relatively cool or warm; (3) a summer or winter dominant precipitation regime.

Following our earlier discussion, it is possible to evaluate the effect that these various climatic conditions may have had on the feasibility of farming in the survey area. For this purpose, it is useful to distinguish an "upland" area from a "lowland" area. The former is above 7000' and encompasses the survey area at the base of Elden Mountain; the latter is below 7000' and encompasses a large area extending to the Little Colorado River (4300') to the northeast of the survey area and to Angell (5900') to the east.

In using this division, it is not difficult to appraise specific climatic conditions in terms of the extent to which they favor or discourage farming in the upland or lowland. The upland is characterized by relatively abundant precipitation (beneficial to agriculture) and a short growing season (deterimental to agriculture) while the lowland is correspondingly characterized by reduced precipitation (detrimental) and a long growing season

AGE A.D.	PRECIPITATION	TEMPERATURE	SEASON OF DOMINANT PRECIPITATION	UPLAND	LOWLAND
	DRY	COOL ↑ WARM	WINTER ↑ SUMMER	-1 +1	-1 -1
—1200—					
	WET			+1	+1
—1100—					
	DRY	WARM	SUMMER	+1	-1
—1000—					
	WET?	COOL?	WINTER?	-1	+1
	DRY	?	?	?	?

Figure 4. The tentative climatic chronology worked out for the Flagstaff area by Hevly et al. (1977). The two right-hand columns assess the favorability of conditions for farming the upland and lowland zones respectively.

(beneficial). In the following chart, any change which ameliorates a deterimental condition is coded as +1, while any change which aggravates a detrimental condition is coded as -1.

	Upland	Lowland
warm	+1	0
cool	-1	0
dry	0	-1
wet	0	+1

It should be noted that the numerical values serve only to rank the specified climatic conditions in terms of their postulated effects on the two zones and are not intended to signify absolute measurements. The presence of a summer or winter dominant precipitation regime is also of potential significance to prehistoric farming (e.g., Schoenwetter and Eddy, 1964), but the specific manifestation that these conditions would take in the survey area is unclear to me and I have excluded this variable from the analysis.

The two right-hand columns in Figure 4 estimate the relative environmental potential for farming in upland and lowland respectively. As can be seen, precipitation and growing season conditions were favorable for farming in the upland from about A.D. 975 to A.D. 1150. Before 975, cooler conditions discourages farming in this zone, while after 1150, the onset of a trend toward cool and dry conditions probably made the entire Flagstaff region less suitable for agriculture and probably played an important part in the region's virtual abandonment by A.D. 1300.

The 175 year period from A.D. 975-1150 can be subdivided if we consider the relative conditions in upland and lowland. Notably a wet episode dated at about A.D. 1100-1150 was characterized by the most favorable conditions for farming in both upland and lowland zones witnessed at any time covered by the chronology. During this period, the upland loses its "advantage" (in terms of our coding) over the lowland. We might anticipate heavy occupation of the lowland and possibly even a population movement from upland to lowland at this time. This matter is complicated, however, since this 50 year period coincides with the time when the postulated effects of the Sunset Crater eruption were maximal in the lowland areas affected by the ash fall. That is, both the eruption and climatic conditions were simultaneously favoring lowland occupation. Distinguishing the two effects may not be easy, but perhaps the following argument will help.

The constellation of favorable climatic conditions during the first half of the twelfth century was not unique to the Flagstaff region, but, in fact, is paralleled in the climatic records from other regions on the Colorado Plateau and in the Greater Southwest (Hevly, et al., 1977; Euler et al., 1979). This general pattern may well be associated with the dramatic cultural changes and overall population growth recorded for the Southwest at this time. The Sunset Crater eruption, in contrast, was a unique and

local phenomenon. If, in fact, this eruption prompted a population influx to the Flagstaff region, we can expect a greater diversity of cultural materials drawn from a wide area to signal the posteruptive archeological record. The sudden and dramatic nature of this signal would serve to distinguish the influence of the eruption from a more general and gradual increase in regional interaction. This argument, of course, is not a new one, and more or less conforms to earlier discussions of the pre- and posteruptive patterns (e.g., Colton, 1936; Schroeder, 1961).

A major ingredient of our model then is an expected correspondence between a proposed climatic chronology interpreted in terms of its influence on agriculture and the archeological evidence of site frequency and distribution. This choice does not reflect any predisposition for "environmental" explanations. It is justifiable in this case because the survey area is a high altitude zone where small climatic changes may have had a major impact on agricultural feasibility (see Parry, 1978).

In addition to site frequency and distribution, it is important that the model specify the kinds of sites most likely to occur during particular periods. Were sites occupied on a temporary or permanent basis? What kinds of activities were carried out at particular kinds of sites? Such questions have been addressed most systematically by Pilles (1977a, 1977b) in his distinction between permanent habitation sites ("villages") and seasonally occupied field houses. As Pilles indicates that his site typology is extendable to our survey area (1977a:13), it deserves discussion here.

According to Pilles, the defining characteristics of Sinagua field houses include:

> . . . a masonry foundation, a brush or a jacal superstructure, and a floor area under 13 square meters, usually less than 7 square metters. Fire pits and hearths are infrequent. Trash usually consists of fewer than 500 sherds and is simply scattered about the room. Intrusive ceramics can be expected in about the same proportion as in permanent habitation sites, but more types of intrusive ceramics will be found on permanent habitation sites. Artifacts indicate a limited range of activities at field houses and suggest an emphasis on mealing. A complete lack of anvils and polishing pebbles indicates pottery was not manufactured at field houses. (1977a:11)

In contrast, permanent habitation sites consist of multi-roomed pueblos or villages of several pithouses. Rooms usually contain hearths and always exceed 7 square meters in floor area and, in more than half the cases, exceed 13 square meters. Trash is more extensive than in the case of field houses, and the range of artifacts indicates that a wide variety of activities was performed at these sites. Although our survey data suggest some amendments in this criteria, Pilles' distinction between permanent habitation sites and field houses is a useful and important one.

On a functional level, permanent habitation sites can be equated with "communities," i.e., "where people live," while field houses represent special activity sites related to the tending or harvesting of crops. The question is immediately raised, why have field houses at all? In addressing this question, two major factors can be cited, both of which can be exemplified with ethnographic evidence from the Southwest.

> 1) If the amount of farmland within a reasonable distance from a community is insufficient to support the members of that community, then field houses may be built at the more distant farms. Such structures provide short term shelter during the growing season and may also be used for temporary storage of crops at harvest time. Under these conditions, the use of field houses can be expected to increase with population aggregation and with the need to bring increasingly distant lands into cultivation (e.g., see Haury, 1956:7).

The field house as a symptom of increasing distance or travel time between community and farm is well attested in the ethnographic record, being reported for the Hopi (Forde, 1931:391; Hack 1942:28), Zuni (see discussion in Woodbury, 1961:14, 43), and the Rio Grande Pueblos (Lange 1968:42-43, 102).

> 2) Field houses may also be viewed as part of a farming strategy in which fields are purposely placed over a wide variety of environmental conditions in order to lessen the risk of crop failure in any one area. Such a strategy is particularly sensible given the highly variable and localized patterns of rainfall and temperature which were stressed earlier. In this case, permanent habitation sites would presumably be located near the most extensive tracts of available prime farmland while field houses would tend to mark smaller and more distant patches of farmland.

Such a strategy is, in fact, well recorded for the Hopi where fields are dispersed over a number of environmental zones differing in their moisture, temperature, and edaphic conditions (Forde, 1931:369).

Although not mutually exclusive, the two major conditions for field house use which are sketched above are logically distinct, and we might well ask which condition was most operative in the context of the survey area. In answering this question, it is possible to pursue an admittedly speculative but otherwise reasonable line of argument. The largest archeological settlement in the survey area is Elden Pueblo, a site containing at least 50 rooms (Colton, 1932b:22). If we assume that all rooms are occupied simultaneously (unlikely) and that each room housed a nuclear family of four individuals (even more unlikely), then a maximum of 200 individuals lived in this settlement at one time. Ethnographic observations of the Hopi, although clearly not directly extendable to the prehistoric Sinagua, nevertheless afford a reasonable way to estimate the amount of farmland needed to support the Elden Pueblo community. As summarized by Bradfield (1971:21), each Hopi requires about 2½ acres of cultivated land to supply the food used for his own consumption, for long term storage, and for trade

during the course of a year. Furthermore, let us assume that 3 miles is the maximum distance between community and field that a farmer will be willing to traverse before he will construct a field house for overnight use (see discussion in Zarky, 1976). A 3 mile radius centered at Elden Pueblo sweeps out an area of about 18,000 acres, of which 500 acres or about 3 percent of the accessible land will be needed by the community. This figure is reasonably close to the percentage of cultivated land among the recent Hopi (Hack, 1942:31; Bradfield, 1971:19), and does not seem inordinately high given that the location of such a large settlement as Elden Pueblo was probably selected in part on the basis of proximity to abundant farmland. Since all other known permanent habitation sites in the survey area are much smaller than Elden Pueblo, distance alone would not seem to be the major factor accounting for the use of field houses.

We are thus left favoring the view that field houses in the survey area, rather than being an epiphenomenon of population aggregation, are more likely to be expressions of a farming strategy which exploits a number of dispersed environments and which serves to buffer the danger of crop loss. This view has interesting implications for the survey. As suggested earlier, altitude is perhaps the single most important determinant of the variables critically affecting agriculture. Field houses then can be expected to occur in different altitudinal zones than permanent habitation sites. Since the survey area is relatively narrow - nowhere more than 2 miles wide at right angles to the major contours - field houses and permanent habitation sites can be expected to have a mutually exclusive distribution in the survey area during any one period of the prehistoric past.

We are now in a position to summarize our major expectations:

1) During the period A.D. 925-975, the survey area was dominated by cool and wet climatic conditions inimical to farming. For this period, we expect a low density of farming settlements.

2) During the period A.D. 975-1100, dry and warm conditions favored occupation of the survey area. For this period, permanent habitation sites can be expected.

3) During the period A.D. 1100-1150, a combination of wet and warm conditions favored farming throughout the Flagstaff region. On the other hand, the upland (including the survey area) simultaneously loses its advantage over the lowland in terms of favorable conditions for farming. At this time, we can expect increased occupation of the lowland while the upland becomes increasingly reserved for secondary farms associated with field houses.

4) The half-century episode discussed in (3) above also coincides with the aftermath of the eruption of Sunset Crater. Any population influx into the Flagstaff region in order to capitalize on the beneficial effects of the eruption should be reflected in a rather sudden and dramatic increase in the cultural diversity manifest in the archeological record.

5) A return to dryer conditions at about A.D. 1150 would again favor occupation of the survey area on a permanent basis.

6) The onset of a drying and cooling trend at about A.D. 1150 would increasingly discourage farming in the Flagstaff region and should be reflected in decreasing population. During this time, we might also expect increasing signs of stress such as the amplified use of field houses or the appearance of defensive sites.

Now that a structure of inquiry has been defined, it is time to turn to the descriptive detail which comprises the major part of this report.

OBSERVATIONS

Preliminary Considerations

Perhaps the fundamental conceit on which the very possibility of an archeological science depends is that the archeological record is a transformed version of the past behavior which produced it and furthermore that the various transformations which intervene between behavior and its material representation are specifiable. Without such a premise, archeologists must abandon the objective of understanding past behavior altogether. In the present case, the record consists of surface remains collected during a survey of an area which adjoins the modern city of Flagstaff and which has been subjected to considerable modification by professionals and non-archeologists alike. In this context, it is important to ask the following two questions: (1) to what extent are surface remains indicative of the buried contents of sites; and (2) what are the effects of pot-hunting and prior archeological work on the nature and composition of surface remains? These questions are, at least, partially answerable.

We begin with the relationship between surface and subsurface remains, an issue which is not overly represented in the archeological literature (e.g., Matthews 1965; Redman and Watson 1970; Tolstoy and Fish 1975; Baker 1978). Our examination of this issue is of the simplest kind. Table 1 compares the surface and excavated ceramics from three sites in the survey area which have been excavated by Queens College crews. The ceramics are tallied according to typological groupings which, as will be discussed later, are used in establishing a seriational chronology. As can be seen, there is a fairly close concordance between the representation of these ceramic groups in the paired surface and buried samples. This concordance based on inspection, however, is not fully supported by the chi-square statistic, only one of the three cases suggesting insignificant differences between the surface and buried samples. The applicability of the chi-square test to this problem, however, is questionable. Potsherds cannot be treated as independent observations; they come in clumps which represent the vessels from which they are derived. Furthermore, we might expect the effect of such clumping to be more significant in a buried and protected context than in a surface and exposed context.

Perhaps a more legitimate question to ask of this comparison is whether the difference between surface and excavated materials is greater than the difference between the categories created by the archeologist to solve a particular problem. Later we will seriate the surface collections from sites in the survey area; the average similarity between adjacent members in this seriation, as expressed by the Robinson-Brainerd similarity coefficient (Robinson 1951), is 170. The coefficients for the three cases given in Table 1 are 192, 180, and 184 respectively. In other words, the differences between surface and excavated samples are far less than the differences discriminated in our seriation. For our purposes then, an admittedly small sample of three cases suggests that surface remains provide a sufficiently accurate expression of the buried contents of a site.

The second problem - that of the effects of recent pot-hunting and archeological work - is somewhat more difficult to assess. We'll approach such an assessment in the following manner. Each site recorded in the survey is coded as to whether it displays indications of (1) having been professionally worked, or (2) having been looted or otherwise tampered with by non-archeologists. Indications of prior archeological work include flagging tape left by National Forest Service cultural resource specialists, backfilled rectilinear excavations, or citations in the literature. Indications of looting or other unauthorized tampering include pot-holes, beer cans or other evidence of "picnicking" at the site, or close proximity to modern development (some of the sites are virtually in the backyards of suburban homes).

Other things being equal, we might expect that the effects of prior collection, whether by archeologists or others, would include a decrease in the number of decorated sherds and a decrease in the average sherd size (as evinced by weight). Rim sherds, presumably of more interest to archeologists than to the general public, should be rarer in sites formerly worked on by archeologists. As shown in Table 2, these expectations are not supported by the data. Taken at face value these data suggest that the activities of archeologists and looters, if anything, actually increase average sherd weight and the number of decorated and rim sherds! The only explanation which comes to mind for this peculiar pattern is that archeologists and non-archeologists alike have selectively worked at sites which produce higher quantities of decorated or rim sherds. At any rate, these results are too problematic to incorporate into our analysis.

Survey Procedures

Our survey was designed to give complete coverage of a specified area. We almost certainly obtained less. The survey area is dominated by ponderosa pine forest which is occasionally broken by dense thickets of cliffrose or by grass-covered clearings. In the forested areas, a mat of pine litter covers the ground, making the smaller sites lacking conspicuous architecture difficult to discern. Given more time, it would probably be worthwhile to actually sweep away the litter along a series of transects; we did not attempt this.

Table 1. Comparison of the representation of ceramic types in surface and excavated collections from three sites in the survey area.

	QC153				QC154-1				QC154-2			
	Buried		Surface		Buried		Surface		Buried		Surface	
	%	#	%	#	%	#	%	#	%	#	%	#
Rio de Flag Brown	82	6697	79	238	8	125	15	40	30	907	24	82
Angell Brown	8	618	9	26	75	1243	69	185	57	1748	65	220
San Francisco Mountain Gray Ware	7	531	6	19	9	148	5	13	4	109	4	14
Other types	3	245	6	17	8	133	11	30	9	276	7	24
	$X^2 = 1.59$				$X^2 = 23.40$				$X^2 = 10.48$			
	d.f. = 3				d.f. = 3				d.f. = 3			
	$p < .70$				$p < .01$				$p < .02$			

The procedures followed in the survey were quite conventional (e.g., Mueller 1974). First the survey area was partitioned into sections, the boundaries of which were readily definable on the ground and on maps (U.S.G.S. Quadrangles and aerial photographs). Each section was surveyed by a three-member team. Two such teams were in the field at any one time. Each team covered a section by walking out a series of parallel transects, each 30 meters wide, until the entire section was completed. The three members of the team were spaced at 10 meter intervals, and each was responsible for a corridor of ground extending five meters to either side. The centrally positioned member of the team took frequent compass bearings to maintain the parallelism of the "sweeps." When a site or potential site was discovered, the team stopped. One member of each team was responsible for making a "grab" collection of potsherds or other artifacts occurring on the surface. The collection was highly selective and emphasized the procurement of diagnostic decorated sherds useful for a preliminary dating of the site. The two remaining members of the team were responsible for making a sketch map of the site, filling out a standard site survey form issued by the Museum of Northern Arizona, and plotting the location of the site on both U.S.G.S. Quadrangles and on aerial photographs. After the site was recorded in this manner - a task taking anywhere from a half hour to a half day depending on its size and complexity, the survey was resumed.

During the evenings, the two survey teams reviewed the day's discoveries with a third back-up team, also consisting of three members. The function of this back-up team was to revisit the sites located in the survey in order to make more extensive surface collections, to recheck the map locations assigned to the sites, and to prepare more detailed site maps. In the case of smaller sites, mapping was done with a 50 meter tape and compass. On larger sites, an alidade and plane table were used. The procedure of employing a backup team to revisit sites was instructive in an unexpected way. Of 85 sites recorded in our survey, four or five percent of the total were discovered for the first time by the backup team while attempting to find site locations given by the survey teams.

The above description of our survey procedures sounds quite simple and pro forma. In fact, matters were more difficult. First the very identification of a "site" was often problematic. This was particularly the case in the early stages of the survey before the teams had gained some experience with the nature of archeological features in the Elden Mountain area. One of the most common of these archeological features is the pithouse, a structure generally marked by a shallow depression completely or partially bordered by basalt or dacite cobbles. These cobbles are a conspicuous part of the natural colluvial deposits which cover much of the survey area, and they occasionally assume a distribution which mimics the arrangement found in pithouses. In these uncertain cases, the presence of potsherds or other cultural debris usually served to distinguish the cultural from natural alignments. At the beginning of the survey, however, many "possible pithouses" were recorded which later, after careful comparison with indisputable pithouses, were reinterpreted to be natural features.

Table 2. Relationship between selected site characteristics and selected sherd collection characteristics.

Coding	n	N	D	R	W	D/N	R/N	W/N	N/n
A_1L_1	14	1518	126	111	12,230	.08	.08	8.1	108
A_0L_1	17	3379	185	156	19,011	.05	.05	5.6	199
A_1L_0	15	3718	332	224	25,988	.09	.06	7.0	248
A_0L_0	35	2479	149	141	15,843	.06	.06	6.4	71

Key:

A_1/A_0 presence/absence of indication of prior archeological work at site

L_1/L_0 presence/absence of indication of pot-hunting or other unauthorized collection at site

n number of sites for that coding

N number of sherds

D number of decorated sherds (including corrugated sherds)

R number of rim sherds

W weight in grams of sherds

above does not include sherd counts from QC153 and 154

A second problem involved the plotting of site location. Two procedures were followed. If a site could be readily located with reference to features shown on our maps, then a plot was quite simply achieved by determining the distance and bearing of the site with respect to these features. In others cases, where vegetation was particularly dense or where sites were quite distant from reference points, we plotted the site by taking compass bearings on the two radio/firewatch towers visible on the summit of Elden Mountain. Whenever possible, locations were later rechecked by measuring the distances and angles between sites recorded on separate occasions.

A third and more difficult problem involved our use of "grab" collections of surface artifacts rather than rigorously designed samples more suitable for statistical manipulation. The basis for this decision was, on the one hand, practical - "grab" collections are more speedily made and therefore more sites could be recorded in the time available to us - and, on the

other hand, reasonable given our primary objective of assigning age estimates to the sites. This decision, of course, also has a cost. In the case of small sites with few surface sherds, all visible sherds were collected, and sampling was not a problem. In the case of larger sites with more extensive middens, we collected a minimum of 100 sherds and tried to collect all decorated and rim sherds. Given this policy, we might expect the proportion of rim and decorated sherds to increase with the total number of sherds collected. The data tabulated in Table 3 do not clearly support this expectation. The major pattern evinced in this table is the similarity between small (less than 100 sherds) and large (greater than 200 sherds) collections in the proportion of rim and decorated sherds and in average sherd weight; intermediate-sized collections (100-200 sherds) display lower values for these indices. The variation in the values of these indices is quite large and appears to be significant, but the extent to which it reflects biases in our collection procedures or systematic differences in the ceramics associated with sites of different sizes is unclear. We cannot assume that our "grab" collections are representative samples. This point injects new uncertainty into our failure to find expected patterning in the data of Table 2 and, in addition, casts doubt on any subsequent use of these sherd indices for interpretive purposes.

Table 3. Relationship between size of sherd collection and selected collection characteristics.

number of sherds collected	n	N	D	R	W	D/N	R/N	W/N
0-50	32	594	23	35	4946	.04	.06	8.3
51-100	19	1313	104	84	9606	.08	.06	7.3
101-150	7	1001	53	49	5667	.05	.05	5.7
151-200	7	1358	63	46	6812	.05	.03	5.0
201-250	3	684	58	39	5389	.08	.06	7.7
250	13	6144	491	379	40752	.08	.06	6.6

Key: as in Table 2.

Chronology

> Pots and pans do not lie; but that is because they do not speak. (Hocart 1970:14)
>
> I think the potsherds could be made to whisper louder. (Lathrap, 1977:1320)

Our survey did not provide organic material suitable for dendrochronological or radiometric dating. It yielded lots of potsherds, and it is to these pieces of ancient pottery that we must turn to construct a chronological framework for monitoring the tempo of prehistoric cultural change in the survey area. In short, we are asking the potsherds to speak truthfully. It may not be easy, however, to understand what they are telling us.

Our procedure for constructing a chronology is quite conventional and consists of three steps: (1) classification; (2) seriation; and (3) evaluation. Each of these steps requires a separate and somewhat extended discussion.

The first step involves reducing the welter of potsherds collected in the survey to a manageable set of ceramic types suitable for chronological analysis. For this purpose, we have used the well-established ceramic typology give by Colton (1955, 1956, 1958). The advantages of this adoption, aside from convenience, are two. First, the Colton typology was primarily designed as a space-time indexing device. As our survey area is small in size, we can expect the typology to be primarily sensitive to temporal change. Secondly, the Colton typology has become the standard for ceramic description in northern Arizona, and its adoption greatly facilitiates comparisons with the archeological literature and communication of our results to other Southwestern archeologists. This in no sense implies an assumption that the Colton typology is somehow "natural;" other typologies emphasizing different ceramic attributes may be more serviceable for other purposes. A breakdown of the ceramics collected in the survey according to the Colton typology is given in Table 4.

The second step in our chronology building involves the seriation of ceramic collections from individual sites. By seriation is meant the construction of a series such that adjacent members of the series are as similar as possible - similarity, in this case, measured in terms of typological composition. The seriational strategy which we have followed is of the percentage frequency variety given explicit formulation by Ford (1962). Assumptions underlying the use of this kind of seriation for chronological ordering include: (1) other things being equal, cultural changes as evinced in ceramics are gradual and largely non-reversible; and (2) the ceramic collections being seriated approximate units of contemporaneity, i.e., they are generally drawn from a short period of time. Both of these assumptions are assailable; for now, however, what is important is that these operational assumptions be made explicit.

Table 4. Typological composition of site ceramic collections. Types are those defined by Colton (1955, 1956, 1958). Sites are arranged by numerical order within time periods to be defined later.

QC SITE NUMBER	Rio de Flag Brown	Angell Brown	Winona Brown	Turkey Hill Red	Sunset Brown	Sunset Red	Youngs Brown	Unidentified Alameda Brown	Deadmans Gray	Deadmans Fugitive Red	Floyd B/G	Deadmans B/G	Tusayan Corrugated	Coconino Gray	Moenkopi Corrugated	Elden Corrugated	Unidentified Tusayan Gray	Deadmans B/R	Unidentified San Juan Red	Tusayan B/R	Unidentified Tsegi Orange	Kana-a B/W	Black Mesa B/W	Dogoszhi B/W	Shato B/W	Sosi B/W	Flagstaff B/W	Walnut B/W	Wupatki B/W	Tusayan B/W	Unidentified White Ware	Tusayan Polychrome	Red/Buff	TOTAL
1	4	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
2	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
3	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
4-Surf.+ 59-61	589	110	4	1	6	-	5	3	63	5	1	2	2	1	-	-	7	1	1	-	1	1	1	-	-	-	-	-	-	18	-	-	822
5	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
21	52	8	-	-	1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	64
22	187	8	-	-	-	-	-	-	3	-	-	-	2	-	-	-	14	4	-	-	-	1	6	-	-	-	-	-	-	2	-	-	227
50+151	158	66	-	2	1	-	-	-	14	3	-	3	1	-	-	-	4	-	3	-	-	-	8	-	-	-	-	-	-	6	-	-	269
52-55	45	8	-	-	-	-	-	-	13	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68
57-58	103	20	-	-	-	-	-	-	6	-	-	-	-	-	-	-	3	1	2	-	-	1	1	-	-	-	-	-	-	2	-	-	139
65	8	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19
68-1,3,4	152	77	-	-	3	-	4	-	13	3	-	2	3	-	-	-	1	1	-	-	-	1	3	-	-	-	-	-	-	4	-	-	267
80	72	8	-	-	6	-	-	-	2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	90
83	33	4	-	-	3	-	-	-	10	2	-	-	-	-	-	-	1	-	-	-	-	1	1	-	-	-	-	-	-	3	-	-	58
104	61	8	-	-	-	-	-	-	5	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	-	3	-	-	80
153-Surf.	238	26	-	-	-	-	-	-	17	2	-	-	-	-	-	-	3	1	-	-	-	-	5	-	-	-	-	-	-	7	-	1	300
4-1,2,3	155	238	-	-	1	-	1	-	40	4	-	-	1	-	-	-	11	2	-	-	1	-	4	-	-	-	-	-	-	6	-	-	464
7	65	238	7	6	2	-	12	-	3	-	-	1	1	-	-	-	2	-	-	-	2	1	-	-	-	-	-	-	-	6	-	-	346
8	38	58	11	2	1	3	1	-	16	2	1	1	2	-	-	1	1	-	1	-	-	-	4	-	-	-	1	-	-	10	-	-	154
12-1	31	26	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	59
13	20	57	5	1	1	-	2	-	3	-	-	-	-	-	-	-	2	-	-	-	1	-	5	-	-	-	1	-	-	-	1	-	99
14	62	69	2	3	2	2	2	-	7	-	-	2	-	1	-	-	-	-	2	-	-	-	-	-	-	-	2	-	-	1	-	-	157
15	3	3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
16	4	7	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
17	11	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19
18	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
35	37	28	-	-	-	-	8	-	8	-	-	-	-	-	-	-	3	-	3	-	-	1	8	-	-	-	-	-	-	-	-	-	96
38	62	112	-	1	7	-	-	-	26	6	-	1	-	-	-	-	15	3	-	-	3	-	-	-	-	-	-	-	-	14	-	1	251
44	3	7	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	13
46	36	21	2	-	-	-	-	-	8	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	71
62	35	102	1	-	3	13	2	-	12	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	172
63	5	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
64	61	37	-	-	3	1	5	-	7	-	-	2	-	-	-	-	4	-	1	-	-	-	-	-	-	-	-	-	-	8	-	-	129
68-2	36	92	-	3	2	1	-	-	4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	140
88	5	17	1	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	28
92	39	47	1	-	-	-	-	-	6	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	6	-	-	101
105	13	8	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
152	-	12	5	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
154-2 Surf.	82	220	4	-	-	1	-	1	14	-	-	-	-	-	-	-	7	3	1	-	-	-	2	-	-	-	-	-	-	4	-	1	340
6	26	171	11	1	12	6	8	-	11	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	251
10	9	350	23	2	2	3	10	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	403
11	-	1	1	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29
24	-	17	4	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	28
26	28	344	65	-	1	-	1	-	73	17	-	10	27	-	-	-	19	-	3	-	6	-	1	-	-	-	-	-	-	38	-	-	633
32	-	11	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14
39	-	12	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	17
40	1	7	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
41	12	51	10	-	4	-	1	-	2	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	84
42	-	11	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
43	1	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
45	-	3	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
48	6	187	22	4	5	-	5	-	-	-	-	-	6	-	-	-	-	-	1	1	1	-	-	1	-	-	3	-	-	3	-	-	245
49	3	14	-	-	1	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21
66	17	132	2	-	7	1	-	-	-	-	-	-	3	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	165
69	1	47	5	-	-	-	1	-	1	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	58
70	10	145	5	3	4	-	1	-	5	1	-	-	4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	4	-	-	183
71	12	100	-	1	-	-	1	-	2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1	-	-	119
73	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
74	15	50	10	1	5	-	1	-	9	-	-	-	-	-	-	-	5	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	99
75	1	19	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21
76	3	44	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	53
78	1	178	4	4	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	192
81	2	16	-	-	4	-	2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	26
82	-	12	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17
85	4	63	4	2	6	-	-	1	5	-	-	-	-	-	5	-	3	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	95
87	4	51	3	2	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	65
89	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
93	-	18	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
94	7	166	14	2	-	-	10	-	1	-	-	-	2	-	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	3	-	-	208
154-1 Surf.	40	185	10	-	-	1	2	1	11	2	-	-	1	-	-	-	9	-	2	-	1	-	2	-	-	-	-	-	-	1	-	-	268
23	-	73	55	3	2	-	5	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	5	-	-	145
27	-	62	34	1	3	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	104
28-29	1	555	80	29	39	2	53	2	12	-	-	-	7	-	-	5	4	-	-	-	-	-	-	-	-	1	-	-	1	2	-	-	793
31	27	103	94	9	23	1	30	-	2	1	-	-	-	-	-	1	-	-	-	1	-	-	-	-	1	2	-	-	8	4	-	307
33	-	5	2	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
37	-	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
47	20	98	87	1	-	1	3	2	45	-	-	1	25	-	-	-	8	-	3	-	4	-	20	4	-	-	3	-	-	-	16	-	-	341
84	2	111	7	13	15	7	2	-	3	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	3	-	-	168
86	-	40	8	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	54
90	-	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
91	-	27	4	2	12	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	52
100	-	42	10	3	-	-	6	-	-	1	-	-	4	-	2	-	-	-	-	-	-	-	-	1	-	1	5	1	1	-	5	2	-	84
101	10	265	69	16	7	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	1	2	-	-	376
102	-	52	17	4	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	77
103	8	327	202	33	15	-	4	-	-	-	-	-	3	-	-	-	2	-	1	-	1	-	-	-	-	6	2	1	-	-	4	-	-	609
																																	11,682

Our seriation was initially restricted to site collections having a minimum of 50 sherds and to those ceramic types which are numerically most frequent and least subject to sampling bias, primarily the undecorated sherds of Alameda Brown Ware. Within this ware, the three types Rio de Flag Brown, Angell Brown, and Winona Brown (including small quantities of Turkey Hill Red) predominate, and the core of our seriation is based on the fluctuating frequencies of these types. In assigning a temporal direction to the seriation, we have followed the time ranges which Breternitz (1966) has provided for these types:

Rio de Flag Brown	A.D. 800-1061
Angell Brown	1075-1130
Winona Brown	1075-1200

Our provisional seriation constructed on these bases is diagrammed in Figure 5.

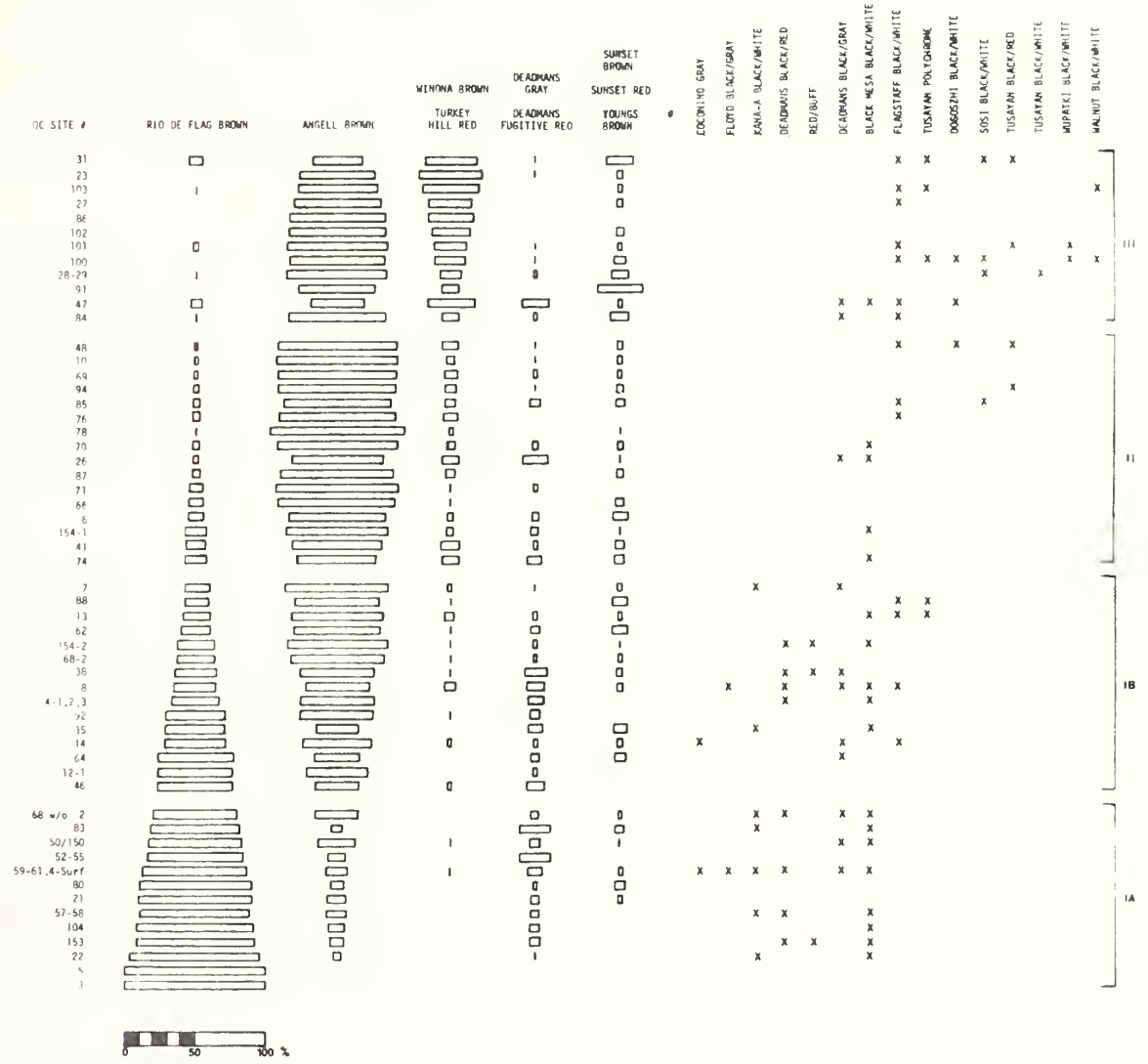
Given the importance that Rio de Flag Brown, Angell Brown, and Winona Brown have in our seriation, a brief discussion of these types is in order. Our usage of these types follows the definitions given by Colton (1958) with the following modifications:

(1) As originally defined by Colton, Angell Brown and Winona Brown were both characterized by the presence of volcanic tuff inclusions in the paste, these inclusions tending to be more numerous and of larger size in the case of Winona Brown. Petrographic examination of the pastes of Angell Brown and Winona Brown sherds by Steve Tomecek, an advanced geology student at Queens College, however, indicates that the inclusions which Colton called volcanic tuff can be more accurately identified as feldspar.

(2) If Rio de Flag Brown and Angell Brown can be readily distinguished by the presence of feldspar inclusions in the latter, the matter of distinguishing Angell Brown from Winona Brown is more difficult. Both of these types possess feldspar inclusions, and their differentiation must involve continuously varying rather than discrete criteria. For this purpose, we employed the following criterion: Angell Brown - maximum dimension of feldspar inclusions less than 2 mm. with most inclusions less than 1 mm.; Winona Brown maximum dimension of feldspar inclusions exceeds 2 mm. As the feldspar inclusions in Winona Brown often reach a size of 5 mm., simple inspection of the paste was usually sufficient to distinguish the two types. In borderline cases, however, the 2 mm. criterion was needed for consistency in classification.

Before proceeding to an evaluation of the extent to which our seriation, in fact, represents a chronology, a few anticipatory observations can be made. As is evident in Figure 5, the seriation of site collections on the basis of the three major Alameda Brown Ware types automatically establishes an

Figure 5. Seriation of site collections. With the exception of QC3 and 5, only site collections having more than 50 sherds are included. As explained in the text, the seriation displays the percentage representation of common undecorated ceramic types and the presence-or-absence distribution of the less common decorated types.



order of other types. The question then becomes whether this "derived" order tends to substantiate the seriation. First we can look at the decorated types. These types occur in frequencies too low to be treated as percentages, but their distribution can be tabulated on a presence-or-absence basis. As seen in the right-hand side of Figure 5 minimally two "clouds" of points are apparent, one in the lower left and one in the upper right of the chart. This distribution looks promising and strengthens our confidence that the seriation is working. The distribution of Deadmans Gray and Deadmans Fugitive Red (both members of San Francisco Mountain Gray Ware) is also reasonable given the long temporal duration of these types (Breternitz, 1966). The distribution of Sunset Brown, Sunset Red, and Youngs Brown (three types of Alameda Brown Ware which share the presence of ash temper) works less well given the post-eruptive age generally assigned to these types. We should note, however, that these three types reach their maximum popularity late in the seriation.

One can seriate just about anything, but seriation for purposes of chronological ordering is a more specific task. In reference to our suggested seriation outlined in Figure 5, the question is raised: to what extent does this seriation represent a chronology, and to what extent does it subsume other dimensions of variability such as "space," "function," or "culture?" Or rephrased, have we created a chimerical chronology by projecting several independent sources of variation onto the single dimension of time? This is not an easy issue to resolve, but there are tests which can strengthen our confidence in the proposed chronology.

To begin, we might ask whether the subtle differences in temper serving to distinguish the types of Alameda Brown Ware actually reflect temporal change or other factors such as vessel function. To examine this question, we give in Table 5 the frequencies of the two most common vessel forms (bowls and jars) for each of the three major types of Alameda Brown Ware. Bowls and jars are broadly conceived vessel categories which are likely to have general functional correlates: bowls are open, generally hemispherical vessels probably used as serving containers; jars are closed, necked vessels probably used in a storage or carrying capacity. These two general forms are customarily found in Southwestern ceramic assemblages and their relative frequency would seem to reflect activity rather than purely temporal factors. The tabulation in Table 5 suggests that our typological distinctions do not correlate in any significant way with these two vessel categories. In other words, paste distinctions appear to be assemblage-specific rather than vessel-specific.

A clearer and more decisive test of the seriation, however, rests on external and independent evidence. In Figure 6, the distribution of decorated types in our seriation is matched with the estimated time ranges for these types which Breternitz (1966) has extracted from a careful review of the dendrochronological evidence. Inspection of this figure suggests that, by and large, the beginning and end dates for these types form a coherent chronological picture when projected against their distribution in the seriation. It is even possible to offer quite precise age estimates for various segments of the seriation. The clustering of Kana-a Black-on-white sherds at one end of the seriation suggests that the covered time span begins by at least A.D. 950, the estimated terminal date for this type. In

Table 5. Distribution of rim sherds from jars and bowls according to period and to type of Alameda Brown Ware.

		Rio de Flag Brown	Angell Brown	Winona Brown Turkey Hill Red
IA	Jars	21	6	
	Bowls	16	3	
IB	Jars	15	14	
	Bowls	7	8	
II	Jars	1	24	5
	Bowls	2	17	6
III	Jars	2	31	30
	Bowls		21	14
Total	Jars	39	75	35
	Bowls	25	49	20

favoring this minimum age for the beginning of the seriation, we are influenced by the fact that Kana-a Black-on-white and Black Mesa Black-on-white form a stylistic continuum and that many of our Kana-a sherds tend toward what Wilson (1969:576-579) calls "Early Black Mesa" (or presumably could just as well be considered "Late Kana-a"). The clustering of types with terminal dates of A.D. 1200 toward the other end of the seriation suggests that the covered time span does not extend significantly into the thirteenth century.

As our seriation was designed to show a gradual change in the frequency and occurrence of pottery types, the matter of subdividing this temporal span into periods is somewhat arbitrary. We have exploited this circumstance by defining periods to suit our own purposes. Four periods are recognized which conform as closely as possible to the climatic periods which Hevly and others have recognized and which were discussed earlier. Such periodization is convenient given the fact that one of our stated objectives is an examination of the nexus between climatic and cultural changes in the survey area. In the following description of the periods (keyed to Table 6), the temporal boundaries for each period were estimated by minimizing the number of decorated types falling outside their respective time ranges. This "best fit" procedure accounts for 81 of 86 occurrences of decorated types, or 187 of the 193 decorated sherds used in the analysis.

Period IA.* Rio de Flag Brown predominates with Angell Brown and Deadmans Gray and Fugitive Red also well represented. The major decorated types are Kana-a Black-on-white, Black Mesa Black-on-white, and Deadmans Black-on-red. Estimated time span: A.D. 950 (or earlier) - 1050.

Period IB. Angell Brown supplants Rio de Flag Brown as the major type. Deadmans Gray and Fugitive Red continue to be well represented. The major decorated types are Black Mesa Black-on-white, Deadmans Black-on-red, and Deadmans Black-on-gray. Estimated time span: A.D. 1050 - 1100.

Period II. Angell Brown predominates. Rio de Flag Brown and Deadmans Gray and Fugitive Red decline in abundance. Winona Brown and Sunset Brown and Red make their first major appearance. The major decorated types are Black Mesa Black-on-white and Flagstaff Black-on-white. Tsegi Orange Ware appears to be replacing San Juan Red Ware. Estimate time span: A.D. 1100-1150.

Period III. Angell Brown is still the dominant type, but Winona Brown increases dramatically. Sunset Brown and Red reach their maximum popularity. During this period, Flagstaff Black-on-white and Sosi Black-on-white replace Black Mesa Black-on-white as the major decorated types. Elden Corrugated and Tusayan Polychrome are well represented for the first time. Estimated time span: A.D. 1150-1200.

Before closing this rather lengthy discussion of chronology, it is worthwhile to further evaluate the reasonableness of the ages assigned to our periods by comparing them with age estimates derived by a different procedure, namely the mean ceramic date technique recently advocated by South (1978). As seen in Table 7, application of this technique to our periods gives a comparatively compressed chronology, and in most cases, the mean ceramic dates fall entirely outside our age estimates. The reason for this disparity is quite simple. In the case of the decorated types, the numerical preponderance of Black Mesa Black-on-white means that all age estimates are heavily influenced by the median age for this long-lived type. In the case of all types considered together, the complete domination of collections by either Rio de Flag Brown or Angell Brown means that we are essentially measuring the median ages for these types. In short, reliance on the mean ceramic date formula would seem to be inadvisable in those cases where long-lived ceramic types heavily predominate. Such an averaging procedure completely swamps the chronological information provided by less frequent but temporally more sensitive types.

*The labels for these periods (IA, IB, II, III) have a private developmental history of significance only to those of us who worked out the seriation. We have avoided changing them and apologize to the reader for not converting to the more logical and acceptable system of I, II, III, IV.

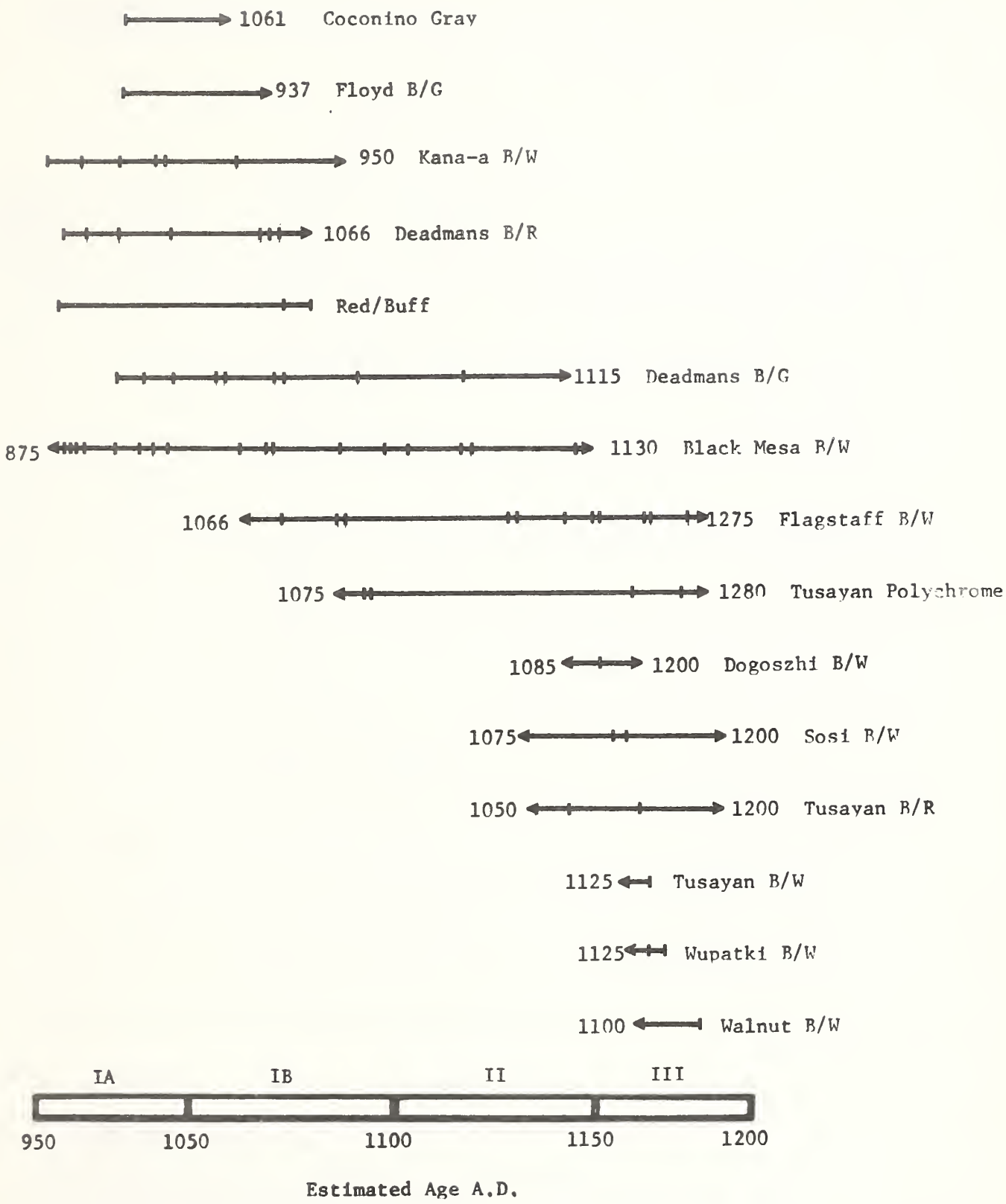


Figure 6. Distribution of decorated types tabulated in Figure 4. The beginning and terminal dates for the types are taken from Breternitz (1966). The hatch marks indicate the occurrence of the type in question.

Table 6. Frequencies and percentages (in parentheses) of ceramic types by period. The frequencies represent a retabulation of the counts presented in Table 4.

	IA	IB	II	III
Rio de Flag Brown	1751(71)	807(30)	203(6)	68(2)
Angell Brown	353(14)	1412(52)	2423(72)	1766(56
Winona Brown, Turkey Hill Red	7	57(2)	235(6)	796(25
Sunset Brown and Red, Youngs Brown	29(1)	82(3)	150(4)	241(8)
Unidentified Alameda Brown Ware	3	1	3	5
Deadmans Gray, Deadmans Fugitive Red	179(7)	173(6)	144(4)	66(2)
Floyd Black on Gray	1	1	-	-
Deadmans Black on Gray	7	9	10	3
Coconino Gray	1	1	-	-
Tusayan Corrugated	8	4	47(1)	40(1)
Moenkopi Corrugated	-	-	7	2
Elden Corrugated	-	1	-	6
Unidentified Gray Ware	36(1)	49(2)	39(1)	16(1)
Deadmans Black on Red	8	8	-	-
Unidentified San Juan Red Ware	6	10	12	5
Tusayan Black on Red	-	-	2	1
Unidentified Tsegi Orange Ware	1	8	12	6
Kana-a Black on White	5	2	-	-
Black Mesa Black on White	27(1)	23(1)	5	20(1)
Dogoszhi Black on White	-	-	1	5
Shato Black on White	-	-	-	1
Sosi Black on White	-	1	1	9
Flagstaff Black on White	-	4	6	17(1)
Walnut Black on White	-	-	-	2
Wupatki Black on White	-	-	-	2
Tusayan Black on White	-	-	-	2
Unidentified White Ware	45(2)	58(2)	63(2)	51(2)
Tusayan Polychrome	-	2	-	6
Red on Buff	1	2	-	-
TOTAL	2468	2715	3363	3136

GRAND TOTAL: 11,682

Table 7

Mean Ceramic Dates for
Periods Suggested in this Report*

Period	Age Estimates Used in this Report	Mean Ceramic Date for Painted Types	Mean Ceramic Date for all Types
IA	A.D. 950-1050	A.D. 970	A.D. 960
IB	1050-1100	995	1040
II	1100-1150	1050	1095
III	1150-1200	1090	1110

*The formula for the mean ceramic date, as given by South (1978:225) is:

$$Y = \frac{\sum_{i=1}^{n} X_i f_i}{\sum_{i=1}^{n} f_i}$$

where X_i = the median date for the manufacture of each pottery type
f_i = the frequency of each pottery type (number of potsherds)
n = the number of pottery types in the sample

Architecture

It's not a house . . . it's a home. (Dylan, 1973:262)

The flanks of Elden Mountain are blanketed by colluvial and alluvial deposits which contain numerous basalt and dacite cobbles. Throughout most of the survey area, these cobbles were a major construction material for the prehistoric Sinagua, and alignments of these unmodified stones constitute the primary archeological trace of prehistoric structures. The following description of the major architectural forms encountered in the survey is keyed to Figure 7; additional evidence is given in Table 8 (estimated floor area), Table 9 (temporal distribution), and Figure 8 (spatial distribution).

I. Circular pithouses which are marked by shallow depressions which may or may not be ringed by a few basalt or dacite cobbles. Estimated floor area ranges widely from 20 to near 70 square meters with a modal area between 46 and 50 square meters. Ten of these structures were recorded in the survey. On the basis of ceramic associations, they are assigned to periods IB, II, and III, being most common in period II. The greatest concentration of these structures is in the southeastern corner of the survey area. This area, unlike most of the survey area, is relatively flat and free of cobbles, a circumstance which probably accounts for the frequent absence of a stone border on these structures.

II. Rectangular pithouses generally marked by a continuous cobble border. This group, comprising 27 examples, is very heterogeneous and undoubtedly subsumes a great deal of functional variability. Floor area ranges from 15 to 115 square meters with a majority of cases falling between 16 and 30 square meters. These structures are found in all periods but are most common in periods IA and IB. They occur in all parts of the survey area; the 4 large-sized examples with floor areas in excess of 70 square meters appear to be evenly spaced, one occurring in each quadrant of the survey area (Figure 8c).

III. Alcove houses: square to sub-rectangular structures with an alcove, in some cases probably serving as an entrance, appended to one side. Floor areas range from about 20 to nearly 60 square meters with modes of about 25 and 40 square meters. These structures are represented in the first three periods of our chronology and are found in all but the most northern part of the survey area.

IV. Thick-walled squarish structures. The walls resemble rock piles more than even courses, suggesting that they may represent toppled masonry. These structures tend to be small, ranging from about 10 to 25 square meters in floor area with a modal area of about 15 square meters. They occur in all periods but are decidedly more common in periods II and III. They are restricted to the northern half of the survey area.

V. So-called doubled structures consisting of a stone-bordered, square or rectangular room adjoining a second room which is only partially outlined by cobbles. This vaguely defined second "room" may, in fact, represent a ramada or outdoor shade. The floor area of the single stone-bordered room ranges from about 10 to 25 square meters. Examples of this structure occur in all time periods and are found in all parts of the survey area.

VI. Figure-8 structures, so-called for obvious reasons. The walls are thick and enclose two small adjoining rooms. The floor areas of these rooms range from about 10 to 25 square meters. The three examples of this structure occur in periods II and III and are found in the northern part of the survey area.

VII. Thick-walled U-shaped structures. These structures have a distinctive plan such that, when viewed from the proper angle, resemble a question mark. They are all small in size, ranging between about 10 to 20 square meters in floor area. They are restricted to the first three periods of the chronology and to the northern half of the survey area.

VIII. Thick-walled oval to rectangular structures. A clear group characterized by small floor area (10 to 20 square meters) and a tight temporal (period II) and spatial (northernmost part of the survey area) distribution.

IX-X. Small structures, generally less than 10 square meters in floor area, which have either an oval (IX) or rectangular (X) plan. They occur in all periods and, with 2 exceptions, are confined to a small area at the northern extremity of the survey area (Figure 7d). These structures are seemingly too small to be domiciles, and we have followed Colton (1946:267) in identifying them as granaries. Of the 18 examples, 15 are found in proximity to larger structures, while 3 occur as isolated structures.

Other structures not incorporated into the above classification include seven "indeterminate" structures, each individually unique, and five cases of multi-roomed pueblos or "pueblitos." These structures will receive individual description later in the report.

The preceding discussion of architecture is nothing more than a descriptive categorization focusing on the form, size, and time-space distribution of structures. To enliven this discussion and to make it more relevant to our research objectives, it is necessary to consider contextual information. Are certain structures customarily found in villages, while others occur in isolation, and what possible functional correlates pertain to these differing contexts?

To address these questions, we have set up a series of settlement types, summarized in Figure 9, which crosscut the previously defined categories of structures. Our rationale for these types is somewhat involved and requires a careful explanation. The following discussion is keyed to Figure 9 with additional information provided by Figures 10 and 11 (floor area), Table 10 (distribution of structures by settlement type), Table 11 (temporal distribution), and Table 12 and Figure 12 (spatial distribution).

To begin, we can consider settlements with several structures (open squares in Figure 9) or alternatively with multi-roomed structures (crossed squares). The number of rooms in these settlements ranges from 3 to 11 with no evidence for modality. The cut-off value of 3 rooms is arbitrary, and our labeling of these settlements as "villages" is purely operational, serving to distinguish them from isolated single or paired structures. The floor area of structures within these villages is diagrammed in Figure 10; a wide range is evident with a clear mode between 20 and 25 square meters. Structure type II dominates the architecture found in villages, and granaries (structures IX-X) are also common (Table 10). When viewed temporally, there is a clear shift from villages with several separate structures in periods IA-IB to multi-roomed pueblos in period III (Table 11). This temporal change corresponds to a spatial shift from the southern to the northern part of the survey area (Table 12, Figure 12).

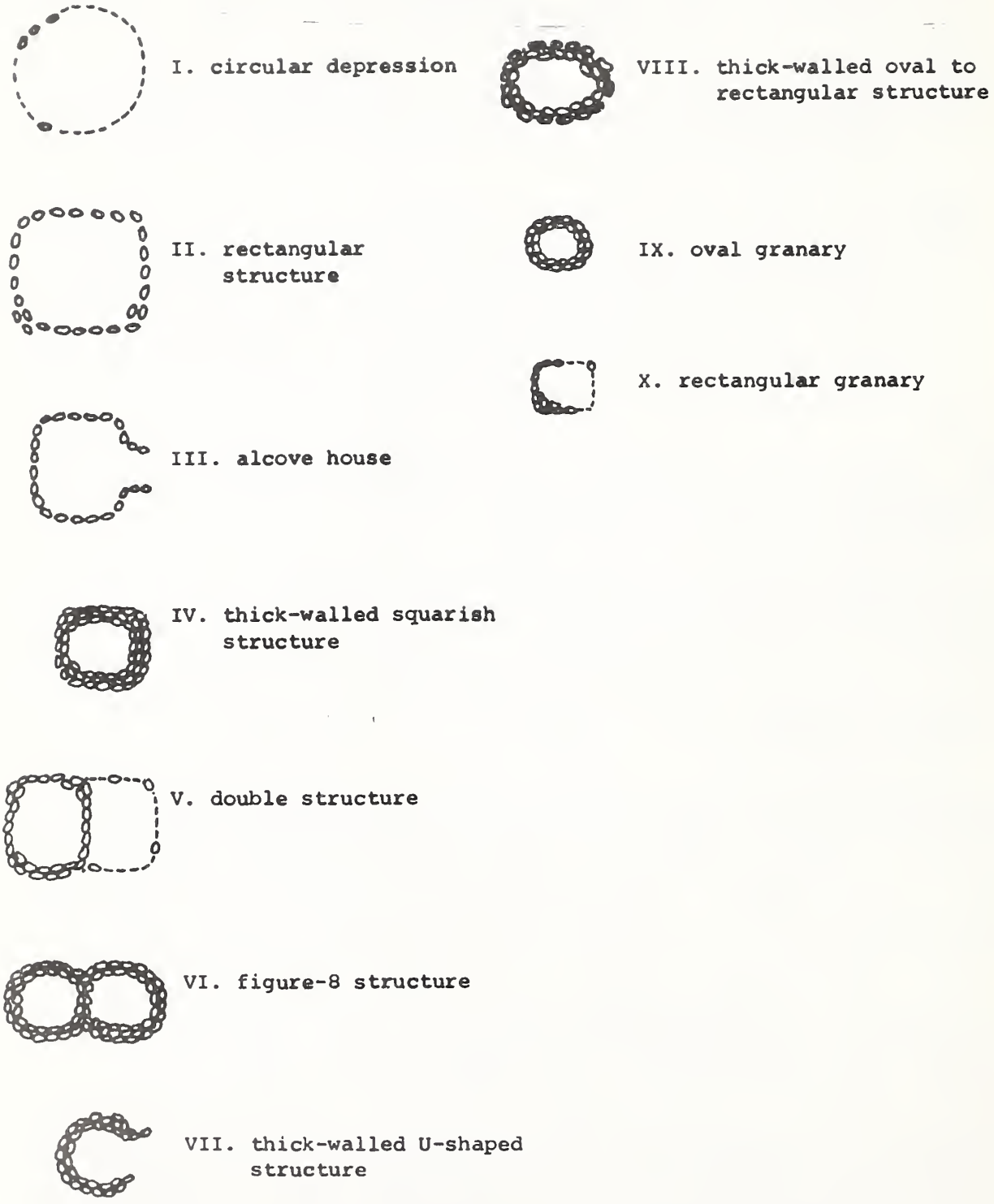


Figure 7. A schematic rendering of the major architectural forms identified in the survey.

Table 8. Estimated floor area of the structures identified in Figure 6.

Estimated floor area in m^2	Type of Structure									
	I	II	III	IV	V	VI*	VII	VIII	IX	X
0-5									5	
6-10				2	3	2	1	1	7	4
11-15		1		6	2	1	3	4	1	2
16-20	1	7	1	3	1	1	1	3		
21-25		4	4	2	1	2				
26-30		5	1	1						
31-35										
36-40		1	3							
41-45	2	1								
46-50	4									
51-55	1	1								
56-60	1	2	1							
61-65		1								
66-70	1									
71-75		1								
76-80										
81-85										
86-90										
91-95		1								
96-100										
101-105										
106-110										
111-115		2								

* each room of figure-8 structures recorded separately

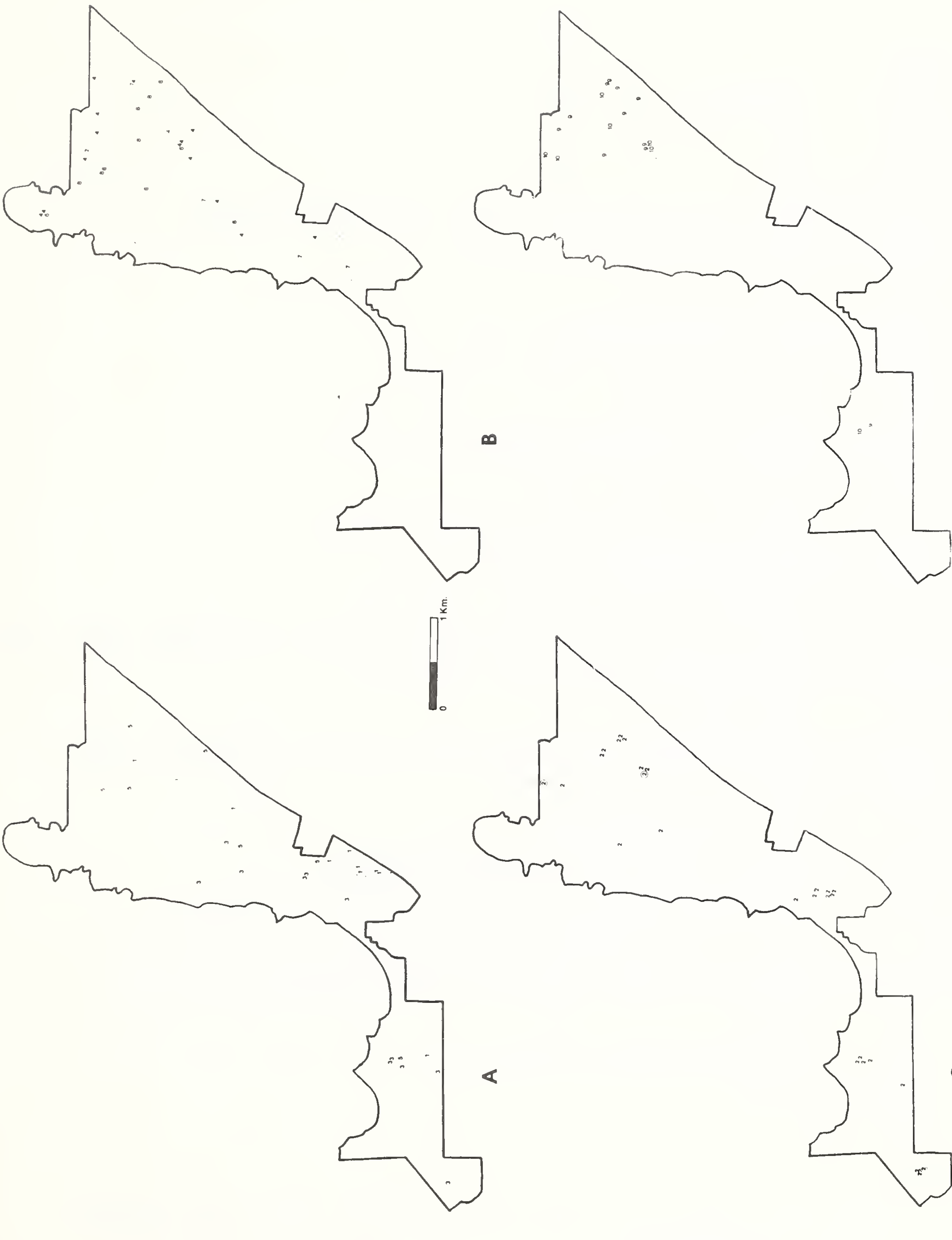
Table 9. Temporal distribution by period of the structures identified in Figure 6.

Type of Structure	IA	IB	II	III	Total
I	0	2	6	2	10
II	11	8	3	4	26
III	3	5	2	0	10
IV	1	1	6	6	14
V	1	1	2	3	7
VI	0	0	1	2	3
VII	1	2	2	0	5
VIII	0	0	7	1	8
IX	3	3	3	4	13
X	2	1	0	3	6
Indeterminate	4	1	1	1	7
Multi-roomed	0	0	1	4	5

Figure 8. (facing page)

Spatial distribution within the survey area of the structures identified in Figure 6 (the Roman numerals used in Figure 6 are replaced by their Arabic equivalents).

A distribution of structures I, III, and V.
B distribution of structures IV, VI, VII, and VIII (all thick-walled structures)
C distribution of structure II; circled cases represent structures with floor areas exceeding 70 square meters.
D distribution of granaries (structures IX and X)


A
B
C
D
0
1 Km.

settlements with three or more structures (excluding granaries) associated with extensive and rich midden

multi-roomed structure (pueblo) associated with extensive and rich midden

settlement with two structures (excluding granaries) floor area of each structure > 20 m^2

settlement with two structures (excluding granaries) floor area of each structure < 20 m^2

settlement with single structure (excluding granaries) having floor area > 20 m^2 usually associated with extensive and rich midden

settlement with single structure (excluding granaries) having floor area < 20 m^2 usually associated with sparse midden

extensive and rich surface scatter without structures

localized and sparse surface scatter without structures

isolated granary

Figure 9. Symbols used for major settlement types; see text for discussion.

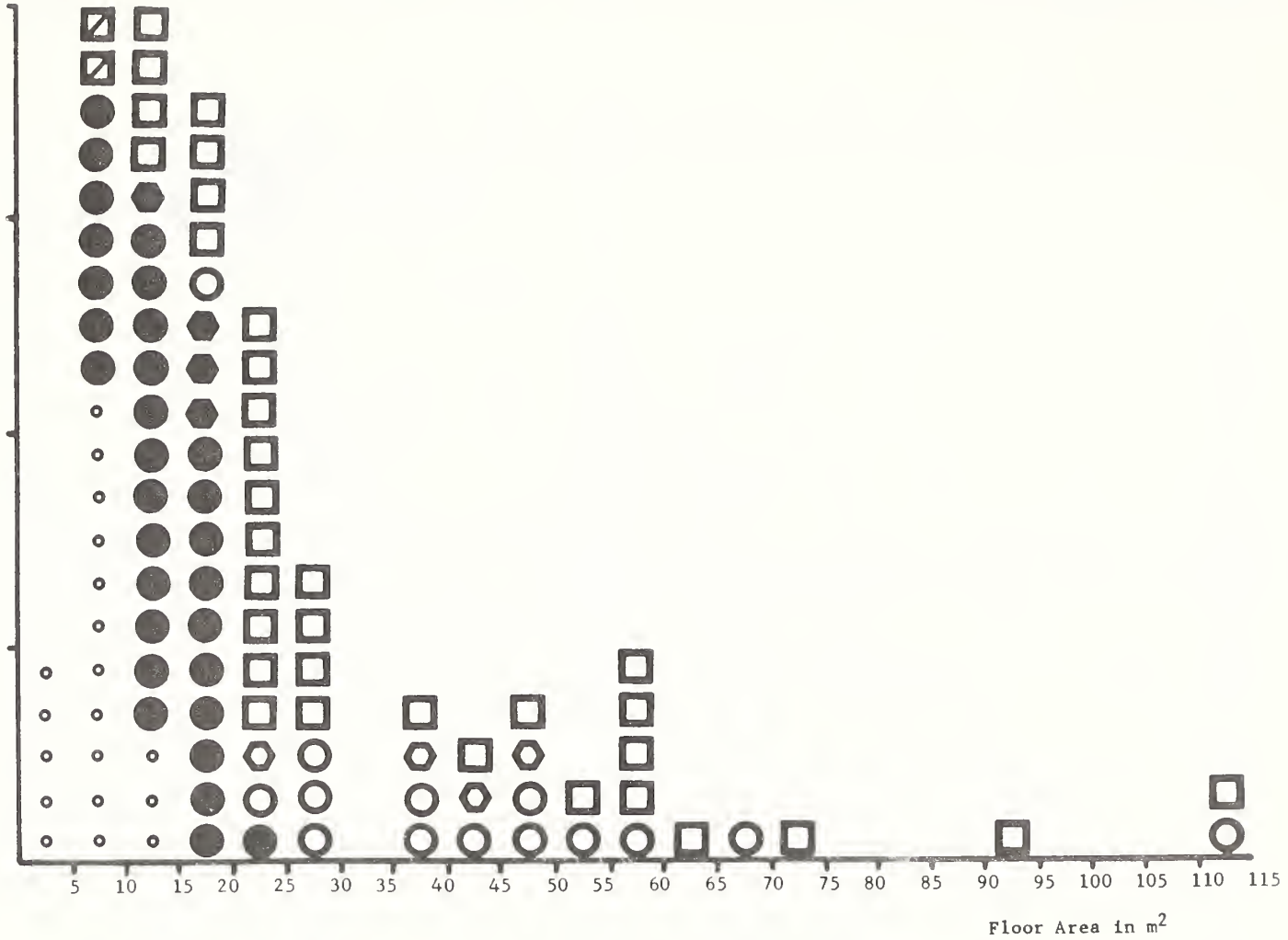


Figure 10. Floor area of structures by settlement type. The symbols are those defined in Figure 9 with the following modification: the small open circles represent all granaries regardless of whether they occur in isolation or in association with other structures.

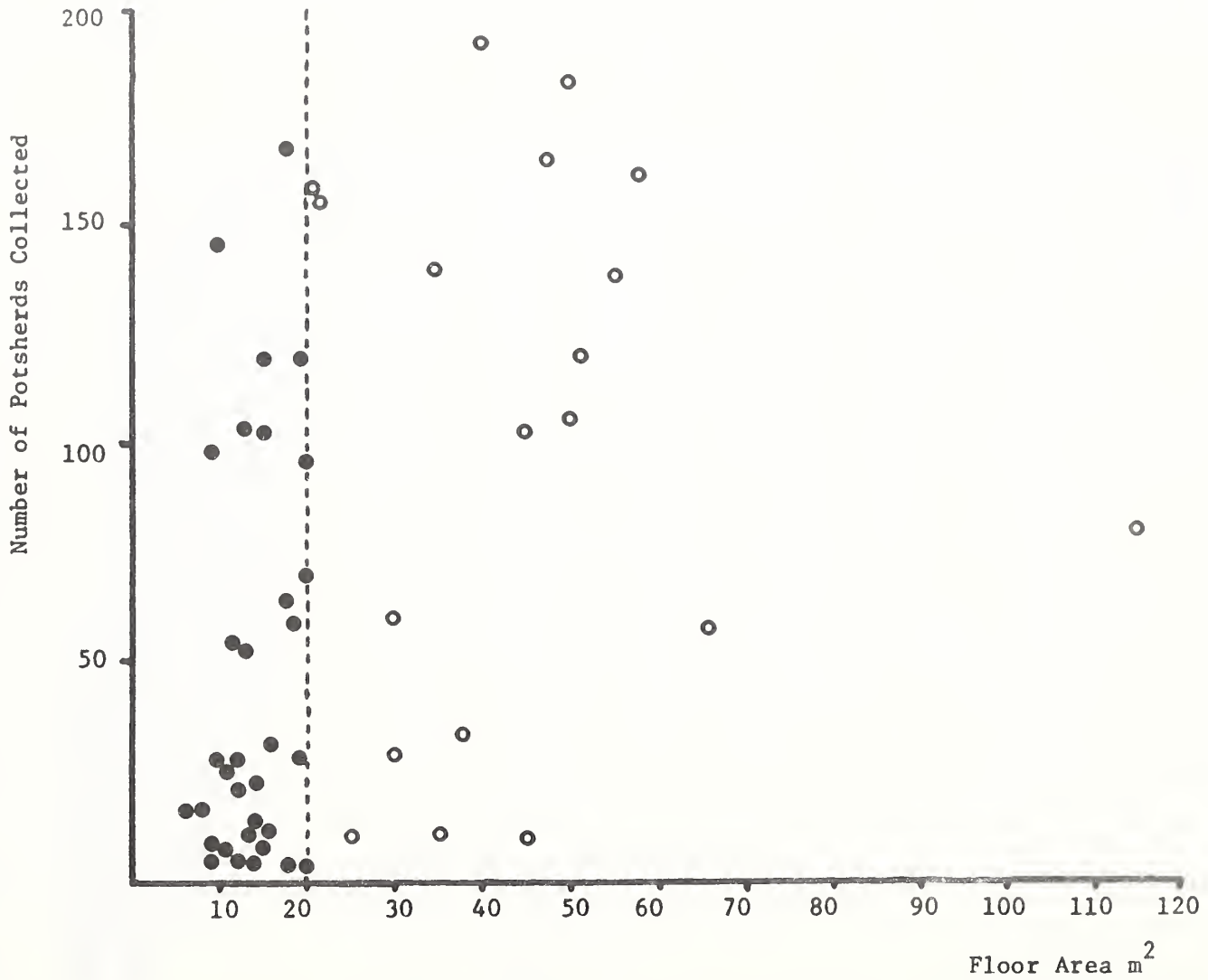


Figure 11. Plot of floor area against number of sherds collected from associated midden for isolated structures. Dark circles represent structures interpreted to be field houses; open circles represent structures interpreted to be permanent habitations.

Table 10. Types of structures occurring in various settlement types. See Figure 9 for key.

Settlement Type	Type of Structure I	II	III	IV	V	VI	VII	VIII	IX	X
	-	-	-	2	-	1	-	-	-	-
	1	18	4	2	1	1	1	-	5	3
	3	1	2	-	-	-	-	-	1	-
	-	-	-	-	1	-	-	1	1	-
	6	3	3	1	-	-	-	-	-	1
	-	4	1	9	5	1	4	6	3	2
	-	-	-	-	-	-	-	-	3	-

Table 11. Frequency of Settlement Types by Period

	IA	IB	II	III
	4	2	-	1
	-	-	1	5
	-	-	2	1
	-	-	2	-
	2	5	7	-
	2	7	15	7
	3	4	2	1
	5	1	2	1
	-	3	-	-

Table 12. Distribution of Settlement Types by Quadrants of Equal Area Proceeding Counterclockwise Around Base of Elden Mountain.

	Quadrant			
	1	2	3	4
	3	2	2	-
	-	-	2	4
	-	2	1	-
	-	-	1	1
	4	9	-	1
	-	6	17	8
	4	1	3	2
	5	-	4	-
	-	-	2	1

Figure 12 (facing page)

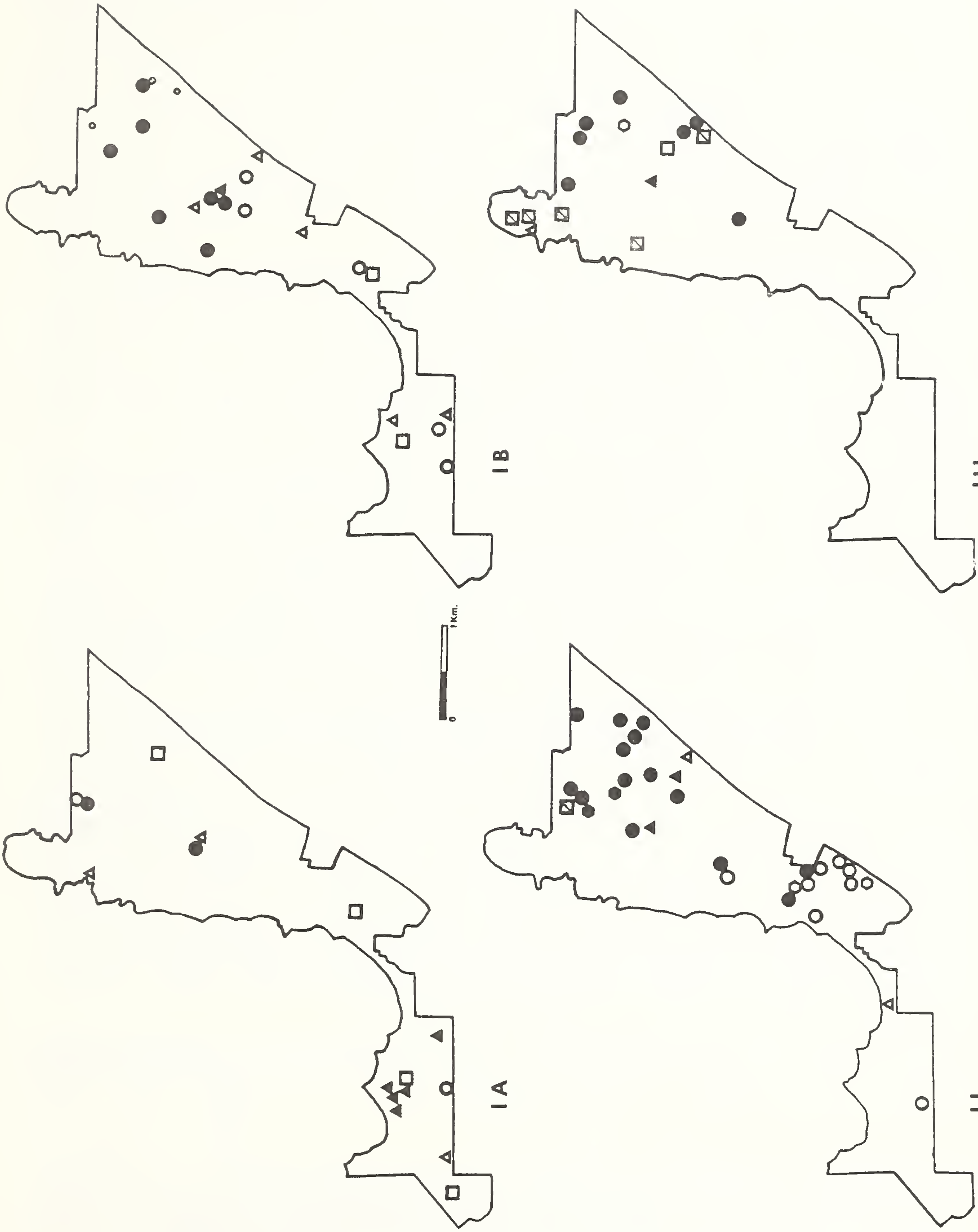
Distribution of settlement types by period. Symbols are those defined in Figure 9.

Period IA

Period IB

Period II

Period III


IA
IB
II
III
0
1 Km.

The second major group of settlements includes sites with a single structure (circles) or two (hexagons) structures. We have subdivided these categories on the basis of floor area and the nature of the associated midden. The logic behind this subdivision is as follows. We will assume that structures found in villages are primarily residential in nature and correspond to the permanent habitation structures of Pilles (see p. 9); exceptions would include small-sized granaries and extra-large structures perhaps having a communal function. Isolated structures which represent permanent habitations - isolated homesteads, if you will - should compare with village structures in floor area. Field houses designed for seasonal use and for a more limited range of activities, on the other hand, can be expected to be smaller. Using this criterion of size, coupled with context, we have subdivided isolated structures into those whose floor area parallels the floor area found in village structures (open circles and hexagons) and those which have a smaller floor area (solid circles and hexagons). As seen in Figure 10, a floor area of 20 square meters serves as a convenient boundary between these two groups of structures; our purported field houses cluster between 10 and 20 square meters while our isolated permanent habitations are larger than 20 square meters.

If this distinction between field houses and permanent habitations has validity, then we might expect it to be supported by independent evidence. As an initial test, we might expect field houses to be associated with more limited middens than are found with permanent habitations. This expectation is supported, although somewhat weakly, by the data plotted in Figure 11. Using 100 sherds as a boundary (recall that this is the minimum number we attempted to collect at each site), 27 of 33 field houses yielded less than 100 sherds, while 11 of 19 permanent habitations exceeded this limit. This pattern seems reasonably supportive given the somewhat unsystematic nature of our collection procedures. As a second observation, we can note that while structure types I-III comprise 41 of 49 structures (excluding granaries) in permanent habitations, our alleged field houses display a completely different pattern in which structure types IV-VIII comprise 28 of 33 structures.* This clear division adds additional support to the "reality" of our distinction. Finally, we should note that field houses and isolated permanent habitations display different temporal and spatial distributions: the former are decidedly concentrated in period II and in the third quadrant of the survey area, while the latter occur most commonly in periods IB-II and in the first two quadrants of the survey area (Tables 11 and 12). Thus our distinction between field houses and permanent habitations involves a four-fold coincidence between floor area, midden, associated structures, and time-space distribution.

A third major group of sites includes surface scatters of potsherds lacking any visible structures. We have subdivided these sites into those with

*The question is immediately raised if the generally thick walls of structure types IV-VIII may not be related to their smaller floor areas. Floor areas, however, were estimated by measuring the area enclosed by the midline of walls, hence systematic differences in measurement would not seem to be a factor.

extensive and productive middens (open triangles) and those with localized and sparse middens (solid triangles). All of these sites will receive individual description in the next section of this report.

Finally, a separate site category consists of isolated granaries. As discussed earlier, granaries generally have floor areas less than 10 square meters and in 15 of 18 cases are found in association with nearby (usually less than 10 meters distant) structures of larger floor area. Given this pattern of association, it is preferable to call the three cases in which these structures occur in isolation isolated granaries rather than field houses.

The preceding discussion, although perhaps an example of classificatory tedium, was designed to define and substantiate a set of operational units which will bridge our expectations, presented earlier, and the "raw data" presented in the following section. In other words, our units are fabricated, but it can be argued that all units or all "things," for that matter, are made up in order to allow relationships to exist (or, in a scientific context, to permit hypotheses to be evaluated). In the following section, we will try to furnish sufficient information for the reader to revise or demolish our system and, if he so wishes, to create new ones more suitable for his needs.

Description of Individual Sites

In the following description, major characteristics of each site are summarized in Table 13.

Surface Sites Lacking Readily Identifiable Architecture
(arranged by period)

QC Site Number: 1

Type of Site: ▲ Period: IA?

Architecture: none Illustration: none

Comments: a thin scatter of sherds strewn over a 20 by 20 meter area; a deep south-trending gully is situated immediately to the west.

QC Site Number: 2

Type of Site: ▲ Period: IA?

Architecture: none Illustration: none

Comments: a thin scatter of sherds and spalls strewn over a 15 by 15 meter area; a south-trending gully is situated immediately to the east; QC2, QC3, and QC5 are all located about 150 meters to the west of the large and productive site QC4 and may, in fact, represent "outliers" of this more extensive settlement.

Table 13. The following four pages summarize the major characteristics of sites recorded in the survey.

QC Site Number	Number Sherds	I	II	III	IV	V	VI	VII	VIII	IX	X	Pueblito	Indeterminate	Checkdams	Number Rooms	Estimated Total Floor Area M^2	Period	Type of Site
1	7																IA?	▲
2	4																IA?	▲
3	23																IA	▲
4-Surf. + 59-61	822		1	1		1				1				3	3	59.6	IA	□
5	23																IA	▲
21	64		1												1	17.5	IA	●
22	227													1			IA	△
50+151	269		3							1					3	75.8	IA	□
52-55	68																IA	△
57-58	139			1											1	55.5	IA	○
65	19																IA	▲
68-1,3,4	269		2					1							3	140.8	IA	□
80	90																IA	△
83	59				1						1				1	18.5	IA	●
104	80		1								1				1	115.0	IA	○
153			3	1						1			4	2?	8	~320	IA	□
4-1,2,3	464		2	2							1				4	102.6	IB	□
7	347		4												4	111.1	IB	□

QC Site Number	Number Sherds	I	II	III	IV	V	VI	VII	VIII	IX	X	Pueblito	Indeterminate	Checkdams	Number Rooms	Estimated Total Floor Area M^2	Period	Type of Site
8	154																IB	
12-1	59			1											1	30.0	IB	
13	99																IB	
14	157	1													1	19.8	IB	
15	8			1											1	15.5	IB	
16	12				1										1	16.0	IB	
17	19																IB	
18	5							1							1	12.3	IB	
35	96		1												1	21.5	IB	
38	250																IB	
44	13									1							IB	
46	70		1												1	20.0	IB	
62	172																IB	
63	9	1													1	45.3	IB	
64	129																IB	
68-2	140			1											1	35.8	IB	
88	28					1									1	9.9	IB	
92	103							1							1	15.8	IB	
105	23									1							IB	
152	20									1							IB	
154-2													1		1	20.5	IB	
6	251																II	
10	403						1								2	30.8	II	

QC Site Number	Number Sherds	I	II	III	IV	V	VI	VII	VIII	IX	X	Pueblito	Indeterminate	Checkdams	Number Rooms	Estimated Total Floor Area M^2	Period	Type of Site
11-1	29				1										1	30.3	II	
24	28				1										1	12.0	II	
26	633													3?			II	
32	14																II	
39	17								1						1	8.8	II	
40	9				1										1	9.8	II	
41	84																II	
42	12								1						1	14.0	II	
43	12								1						1	13.5	II	
45	5								1						1	13.5	II	
48	245					1				1			1		2	31.5	II	
49	21								1						1	12.0	II	
66	165	1													1	47.8	II	
69	58	1													1	66.4	II	
70	183	1													1	50.2	II	
71	119	1													1	52.8	II	
73	4				1										1	18.5	II	
74	99					1									1	9.1	II	
75	21			2											2	60.8	II	
76	53							1							1	13.5	II	
78	192		1												1	39.0	II	
81	26				1										1	10.9	II	
82	17							1							1	6.5	II	
85	95											1			3	~50	II	

QC Site Number	Number Sherds	I	II	III	IV	V	VI	VII	VIII	IX	X	Pueblito	Indeterminate	Checkdams	Number Rooms	Estimated Total Floor Area M^2	Period	Type of Site
87	65								2						2	36	II	
89	4		1												1	20.3	II	
93	23				1					2					1	14.0	II	
94	211	2													2	95.5	II	
154-1			1												1	29.9	II	
23	146				1										1	10.5	III	
27	103					1									1	14.0	III	
28-29	793	1	3		2		1			2	2			3?	8	360.9	III	
31	307											1			11	124.3	III	
33	13																III	
37	6					1									1	9.5	III	
47	331	1	1							1					2	78.1	III	
84	168								1						1	18.0	III	
86	54												1		1	?	III	
90	7				1					1					1	10.5	III	
91	52					1					1				1	12.3	III	
100	79																III	
101	376											1			5	66.1	III	
102	77				2		1								4	38.5	III	
103	609											1			2	35.5	III	
Elden Pueblo												1			50?	750?	III	

QC Site Number: 3

Type of Site: ▲ Period: IA

Architecture: none Illustration: none

Comments: a thin ceramic scatter covering an area of about 20 by 20 meter; a shallow gully runs from north to south through the center of the site.

QC Site Number: 5

Type of Site: ▲ Period: IA

Architecture: none Illustration: none

Comments: a 5 by 5 meters "hot spot" of sherds; a south-trending gully is located about 10 meters to the east of the site.

QC Site Number: 22

Type of Site: △ Period: IA

Architecture: one probable check dam placed across gully. Illustration: Figure 13

Comments: An extensive and rich midden, 100 by 50 meters in area, straddling a wide and shallow south-trending gully; QC21, bearing a single structure, is located about 50 meters to the west, and the two sites may be associated with the same occupation.

QC Site Number: 52-55

Type of Site: △ Period: IA

Architecture: none Illustration: none

Comments: originally recorded as four separate sites, this site is represented by a thin but extensive scatter of sherds and spalls extending over an area measuring about 200 meters east to west by 75 meters north to south; the site is bordered on the south by Linda Vista Drive, is dotted with modern trash, and presumably has been extensively "picked over" by collectors.

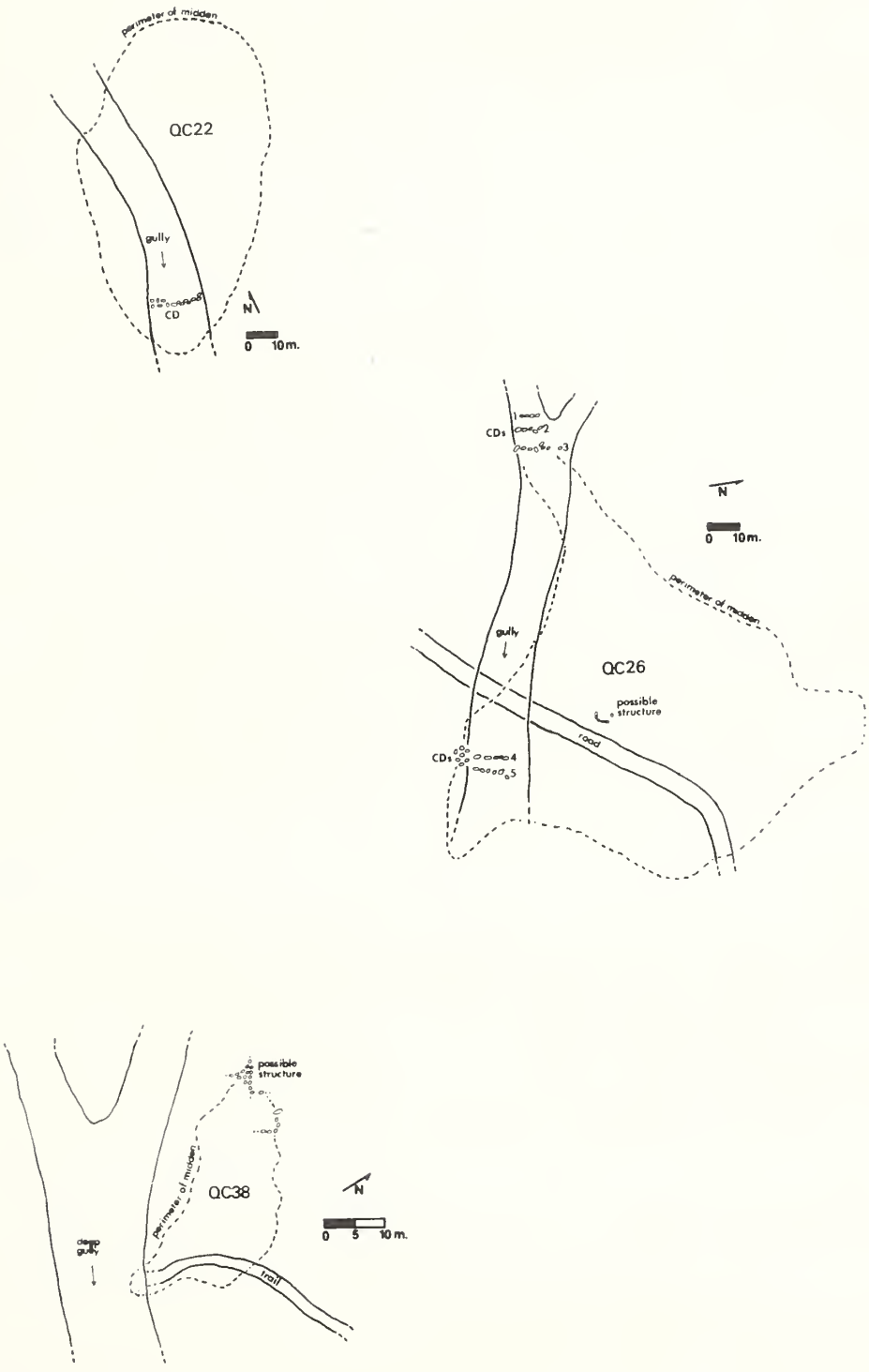


Figure 13. Maps of sites QC22, QC26, and QC38.

QC Site Number: 65

Type of Site: ▲ Period: IA

Architecutre: none Illustration: none

Comments: this site consists of two "hot spots," located about 25 meters apart, which are bordered on the east by a deep gully; the more southerly "hot spot" is a 5 by 5 meters scatter of sherds, while the more northerly "hot spot" consists of a 2 by 2 meters cluster of obsidian chips; in its location and debris, this latter feature may represent a smaller version of the chipping-hunting station more clearly attested at QC62.

QC Site Number: 80

Type of Site: ▲ Period: IA

Architecture: none Illustration: none

Comments: an extensive and rich scatter of sherds and spalls covering an area of about 60 by 30 meters; an east-trending gully is situated about 20 meters to the north.

QC Site Number: 8

Type of Site: ▲ Period: IB

Architecture: none Illustration: none

Comments: an extensive and productive scatter of sherds and spalls covering an area of about 100 by 100 meters in an open field.

QC Site Number: 13

Type of Site: ▲ Period: IB

Architecture: none Illustration: none

Comments: a rich midden of ca. 30 by 30 meters.

QC Site Number: 38

Type of Site: ▲ Period: IB

Architecture: one possible structure Illustration: Figure 13

Comments: a rich sherd scatter of about 35 by 15 meters which is bordered on the south by a deep gully.

QC Site Number: 62

Type of Site: chipping and hunting station Period: IB

Architecture: none Illustration: Figure 14

Comments: this site is unique in the survey; it is situated among a series of large boulders which flank a deep gully descending from Elden Spring, very near the rocky base of Elden Mountain; the artifactual debris is concentrated in four areas (Figure 13) and consists of hundreds of small obsidian chips interspersed with a few sherds; the numerous chips (which appear to be products of pressure flaking) suggest the manufacture and maintenance of stone tools, and the discovery of 3 projectile points is conformable with this interpretation; when visited in July, the gully bottom contained small pools of water, and deer spoor were common; the boulders overlooking the gully provide a natural hunting blind, and it is easy to imagine Sinagua hunters sitting among the boulders and preparing their weapons while waiting for deer or other game to come to drink.

QC Site Number: 64

Type of Site:  Period: IB

Architecture: none Illustration: none

Comments: an extensive but thin scatter of sherds and spalls covering an area of about 75 meters north to south by 25 meters east to west; the site is bordered on the east by a wide gully.

QC Site Number: 6

Type of Site:  Period: II

Architecture: none Illustration: none

Comments: an enormous but extremely thin scatter of sherds which extends for several hundred meters around the southeastern base of Elden Mountain; sherds were never concentrated in a way permitting subdivision of this area into separate sites; as a "site," however, QC6 is clearly conceived differently from other sites recorded in the survey.

QC Site Number: 26

Type of Site:  Period: II

Architecture: 5 probable check dams placed across a wide, shallow gully and one possible residential structure to the north of the gully.

Illustration: Figure 13

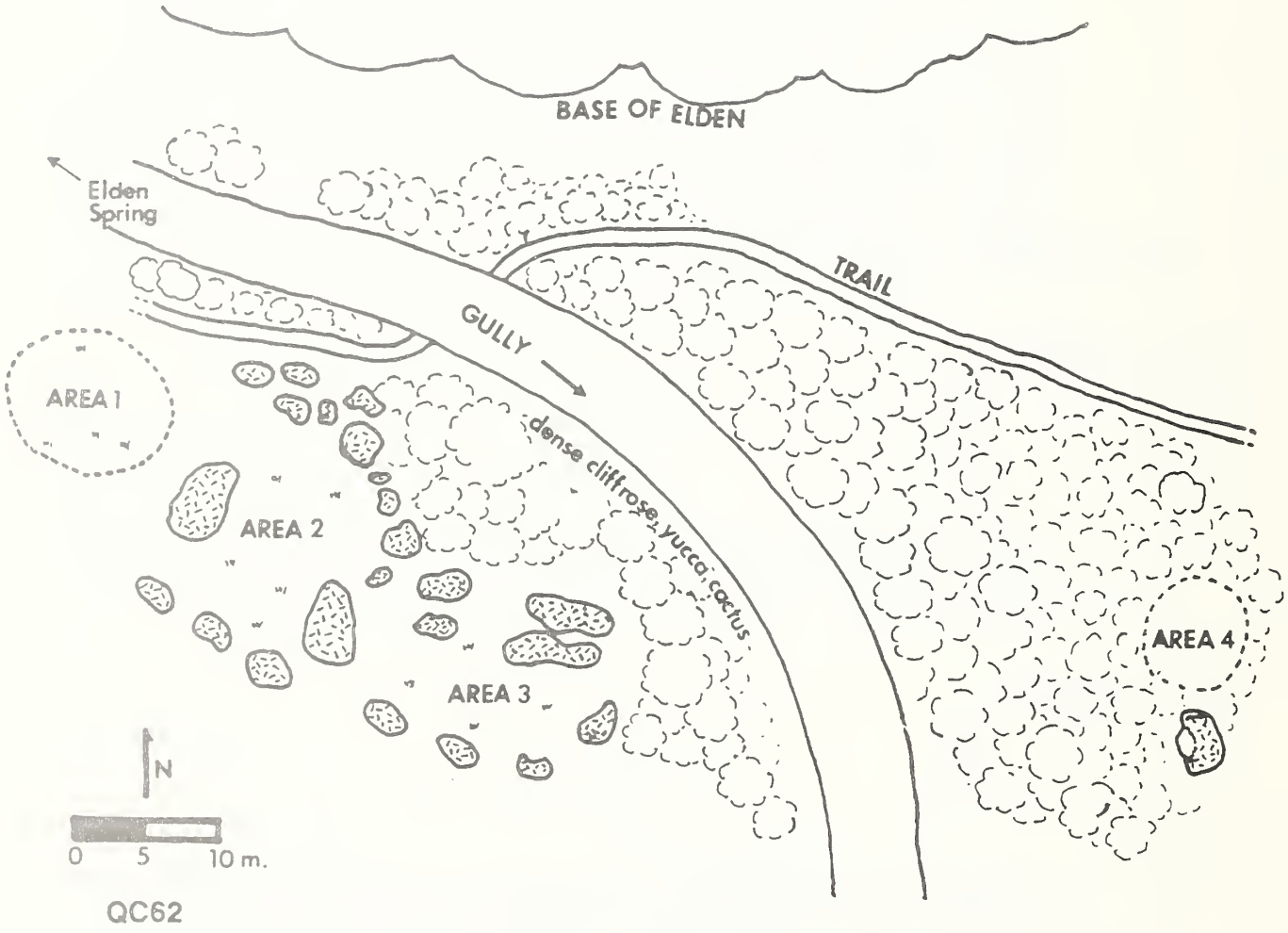


Figure 14. Plan of QC62, the chipping and hunting station at the base of Elden Mountain.

Comments: a large and rich midden covering an irregularly shaped area with maximum dimensions of 100 by 120 meters; the site produced an unusually large number of decorated sherds; the extent and density of the midden suggest the presence of a village but, aside from the check dams, only one right-angled stone alignment - possibly the remnants of a structure - could be discerned.

QC Site Number: 32

Type of Site: ▲ Period: II

Architecture: none Illustration: none

Comments: a 5 by 5 meters scatter of sherds.

QC Site Number: 33

Type of Site: ▲ Period: III

Architecture: none Illustration: none

Comments: a 5 by 5 meters scater of sherds.

QC Site Number: 100

Type of Site: ▲ coupled with remains of historic ranch Period: III

Architecture: no definite ancient structures; foundation of ranch house, one small structure of indefinite function probably associated with the ranch house, and rock alignments marking a driveway and fences.

Illustration: Figure 15

Comments: a large prehistoric midden ca. 140 by 60 meters over which the Conrard ranch was built during the early part of this century (Peter Pilles, personal communication), the historic structures incorporate the same basalt and dacite cobbles customarily used by the prehistoric Sinagua and, at first, were taken to be ancient structures; the site is dotted with ponderosa pine and overlooks an open sandy meadow to the east; historic records and living informants could be fruitfully combined with an archeological study of this site.

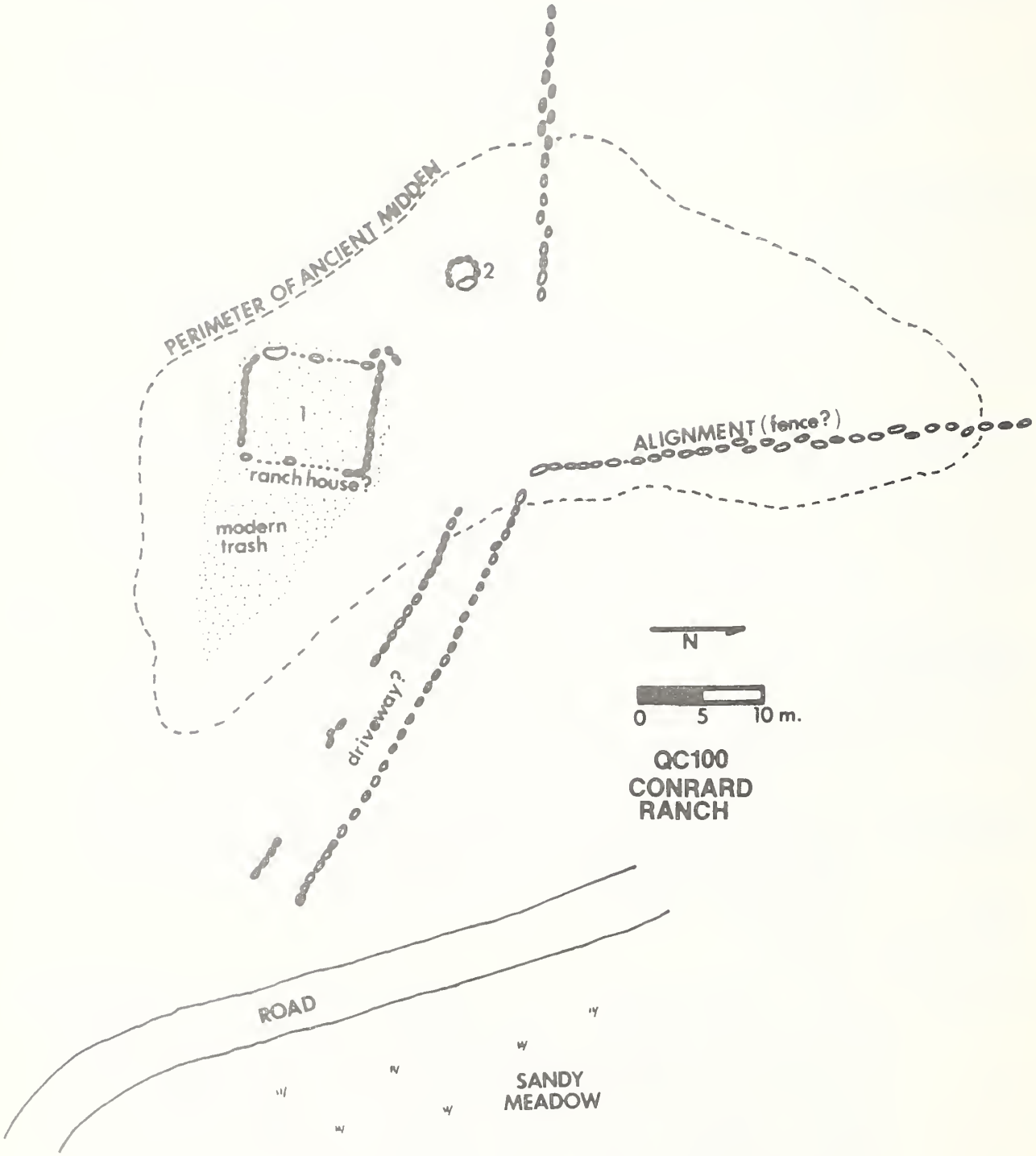


Figure 15. Plan of QC100, showing extent of ancient midden and the superposed remains of the Conrard ranch.

Sites with One or Two Structures of Type I

QC Site Number: 14

Type of Site:  Period: IB

Architecture: a small type I structure Illustration: Figure 16

Comments: the pithouse is associated with a rich crescent-shaped midden centered in a more extensive sherd scatter covering an area of about 140 by 175 meters; the site is situated in a grassy clearing cut by a gully on the east.

QC Site Number: 63

Type of Site:  Period: IB

Architecture: a single type I structure Illustration: Figure 16

Comments: the site is situated in a ponderosa pine forest, and the dense litter probably accounts for the paucity of recovered sherds (9).

QC Site Number: 66

Type of Site:  Period: II

Architecture: a single type I structure Illustration: Figure 16

Comments: the structure is associated with a heavy sherd scatter which extends for 20 meters downslope; the site is situated in a grass-covered clearing fringed by ponderosa pine.

QC Site Number: 69

Type of Site:  Period: II

Architecture: a single type I structure (but see comments below) Illustration: Figure 16

Comments: a light scatter of sherds extends for 20 meters from the structure; QC69, 70, 71, and 94 are all located in a large tract of pine-studded meadow bordered by route 89 on the east and all of these sites consist of one or two large circular pithouses with an associated patch of midden; although recorded as separate sites, there is a possibility that all of these widely-spaced structures represent a single pithouse village.

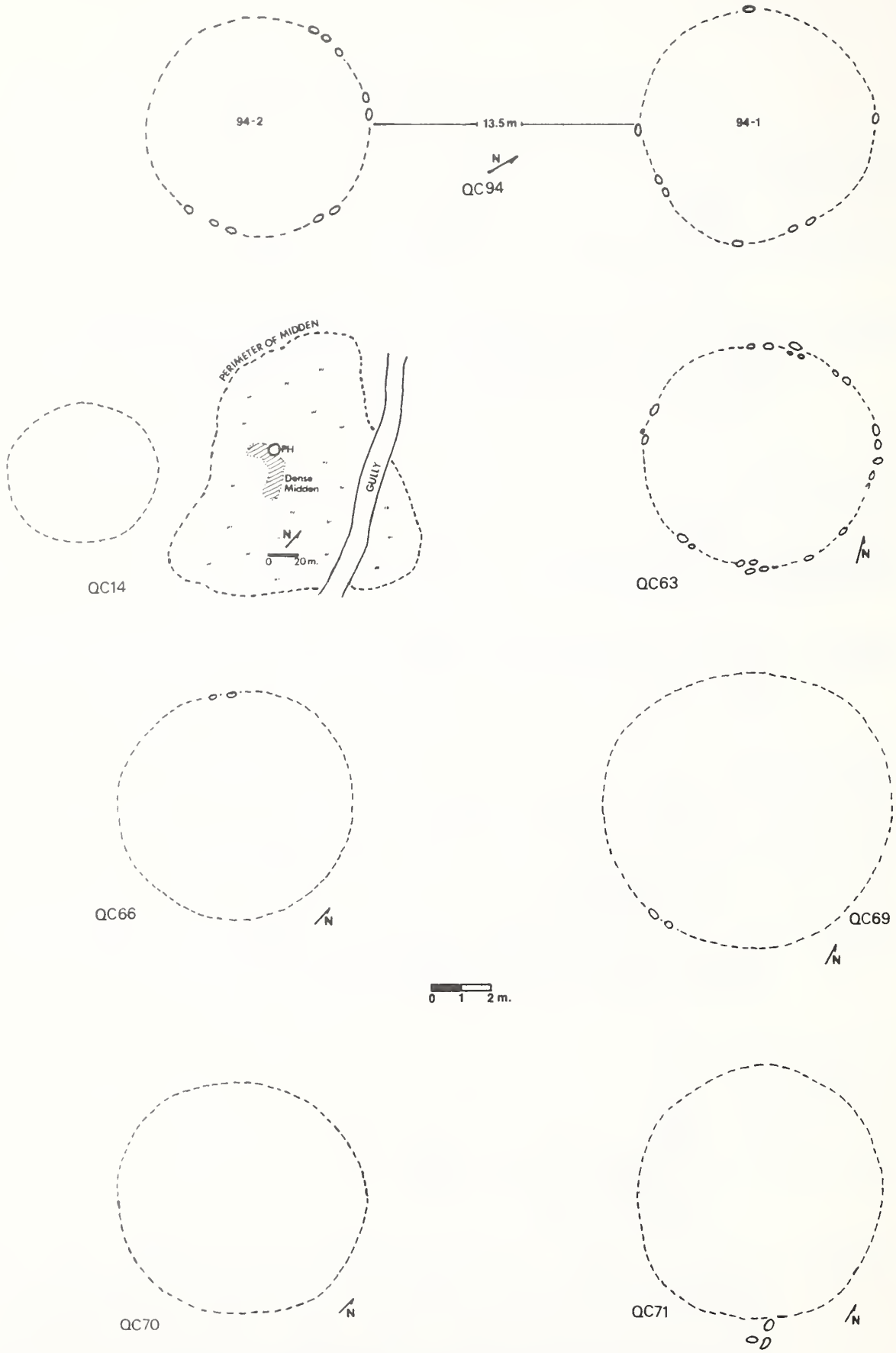


Figure 16. Plans for type I structures.

QC Site Number: 70

Type of Site:  Period: II

Architecture: a single type I structure Illustration: Figure 16

Comments: a dense midden extends for 20 meters from the structure.

QC Site Number: 71

Type of Site:  Period: II

Architecture: a single type I structure Illustration: Figure 16

Comments: a dense midden extends for 20 meters from the structure.

QC Site Number: 94

Type of Site:  Period: II

Architecture: two type I structures separated by 13.5 meters Illustration: Figure 16

Comments: the two saucer-shaped depressions are associated with a rich midden; a more diffuse scatter of sherds extends for 30 meters in all directions.

Sites with a Single Structure of Type II

QC Site Number: 21

Type of Site:  Period: IA

Architecture: a single type II structure Illustration: Figure 17

Comments: a midden rich in sherds extends for 15 meters downslope from the structure.

QC Site Number: 104

Type of Site:  Period: IA

Architecture: one extremely large (115 square meters) type II structure and one type X granary 55 meters to the north.

Illustration: Figure 18

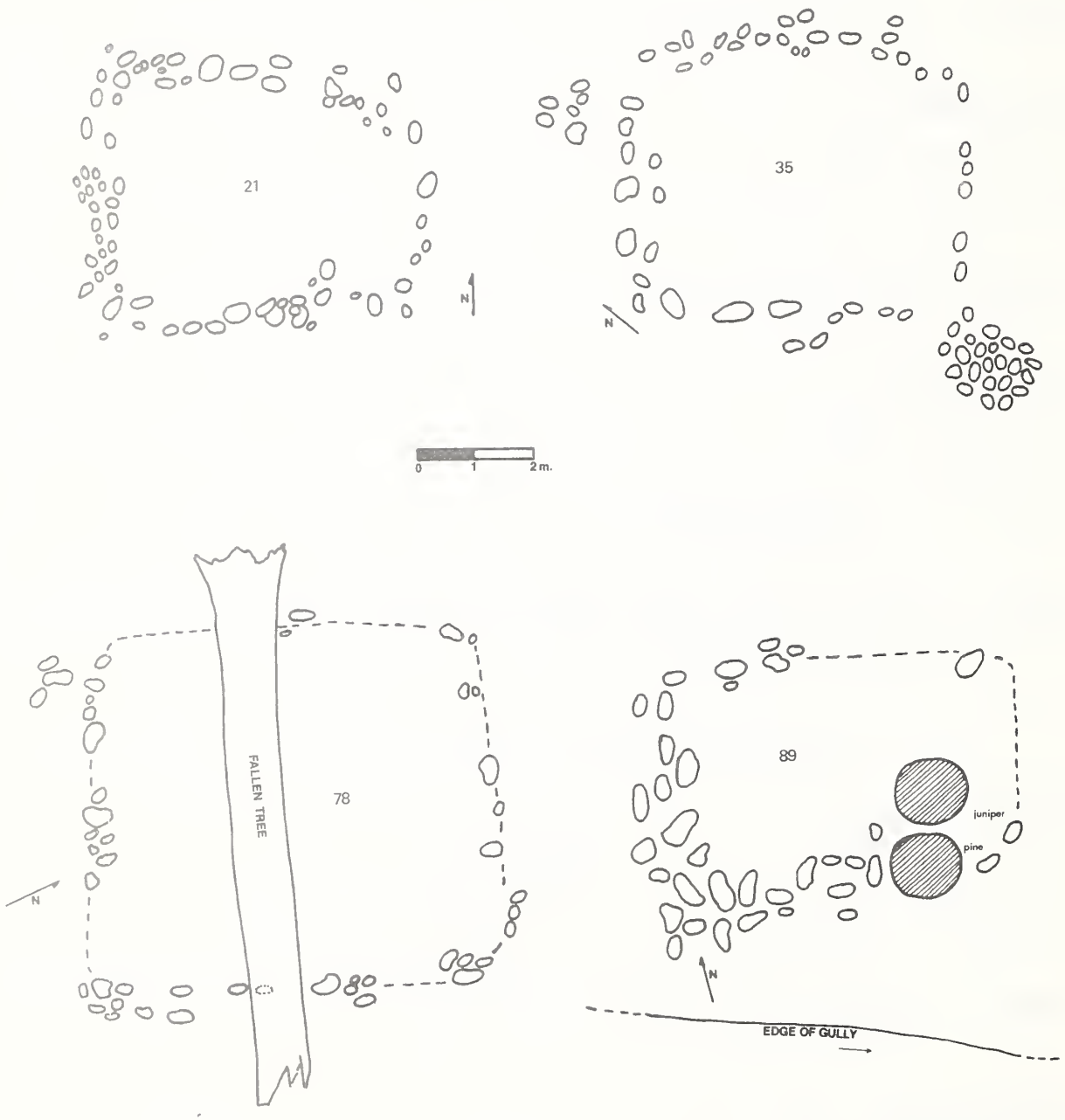


Figure 17. Plans for isolated type II structures.

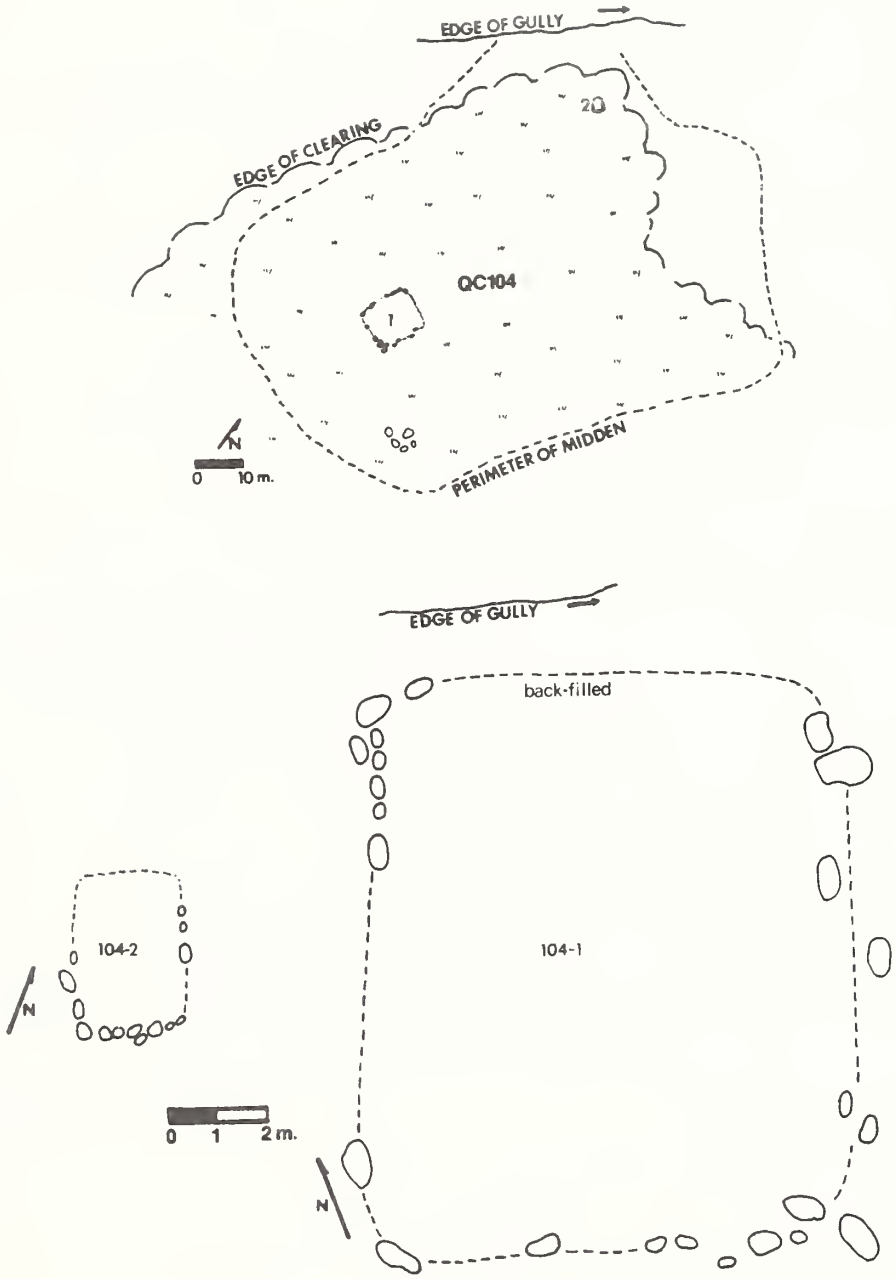


Figure 18. Plan of QC104

Comments: the two structures are associated with an extensive scatter of sherds and spalls which covers a 100 by 80 meter area in a grass-covered clearing fringed by ponderosa pine; the site is bordered on the north by an east-trending gully.

QC Site Number: 35

Type of Site: ● Period: IB

Architecture: a single type II structure with a peculiar cluster of cobbles appended to the southern corner

Illustration: Figure 17

Comments: a rich midden extends for 50 meters downslope from the structure.

QC Site Number: 46

Type of Site: ● Period: IB

Architecture: a single type II structure Illustration: Figure 19

Comments: as shown in Figure 19, midden surrounding this structure is continuous with the midden of QC47 immediately to the west; sherds from QC46, however, indicate an occupation earlier than that represented at QC47

QC Site Number: 78

Type of Site: ○ Period: II

Architecture: a single type II structure Illustration: Figure 17

Comments: a dense midden extends for 30 meters downslope from the structure

QC Site Number: 89

Type of Site: ● Period: II?

Architecture: a single type II structure Illustration: Figure 17

Comments: only a few sherds were found around the structure; the site is situated on a ridge immediately north of an east-trending gully

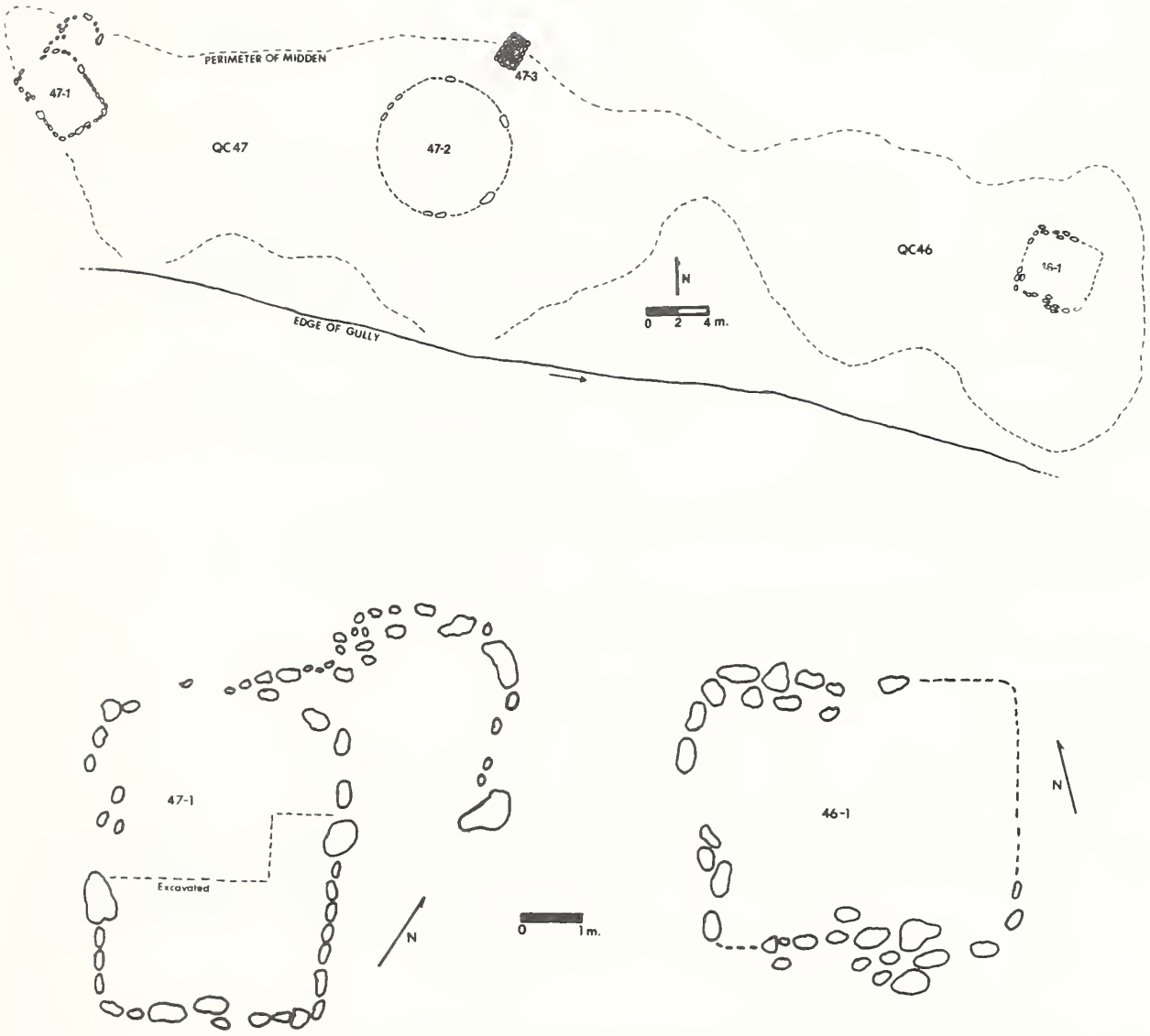


Figure 19. Plan of QC46-47 (top) and details of structures (bottom).

QC Site Number: 154-1

Type of Site: ○ Period: II

Architecture: one type II structure

Illustration: see DeBoer and Billeck (1976) and Appendix I of this report

Comments: this structure was excavated in 1974, and a complete description can be found in DeBoer and Billeck (1976).

QC Site Number: 47

Type of Site: ⬡ Period: III

Architecture: one type II structure with a wing-wall appended to one corner, and a large type I structure associated with a type X granary

Illustration: Figure 19

Comments: the two structures and their associated midden are flanked on the south by an east-trending gully.

Sites with One or Two Structures of Type III

QC Site Number: 57

Type of Site: ○ Period: IA

Architecture: a single large type III structure Illustration: Figure 20

Comments: a large number of sherds are found in the immediate vicinity of the structure; a separate "hot spot" of sherds, unassociated with any architecture, is located about 50 meters to the north of the structure.

QC Site Number: 12

Type of Site: ○ Period: IB

Architecture: a single type III structure Illustration: Figure 20

Comments: the structure is associated with a sherd scatter covering an area of about 20 by 50 meters in a grassy clearing; an east-trending gully is found 15 meters north of the structure.

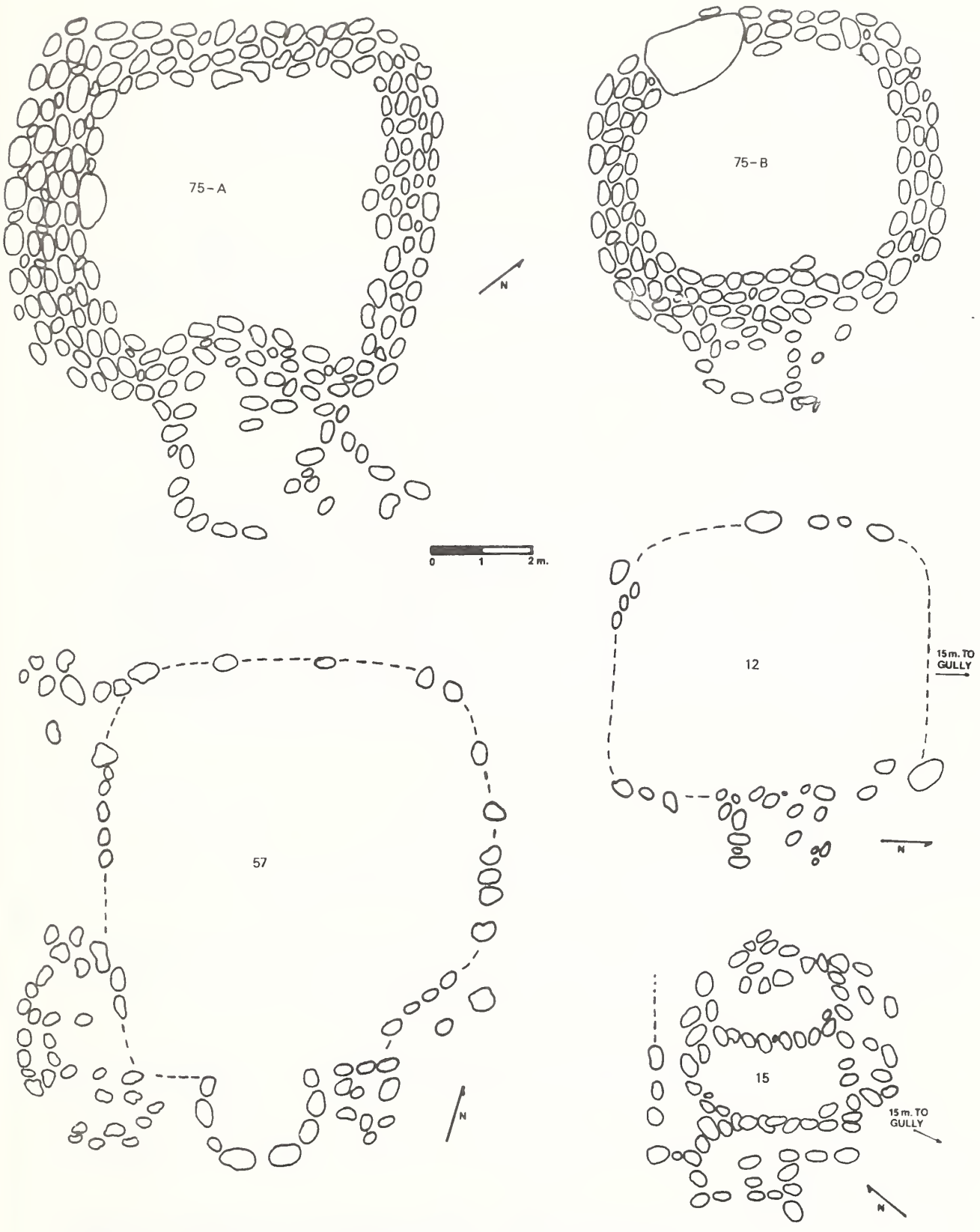


Figure 20. Plans for type III (alcove) structures.

QC Site Number: 15

Type of Site: ● Period: IB?

Architecture: a single small type III structure; the exact outline of the structure is difficult to determine

Illustration: Figure 20

Comments: only a few sherds were found in the immediate vicinity of the structure; a gully is located about 15 meters to the south

QC Site Number: 68-2

Type of Site: ○ Period: IB

Architecture: one type III structure Illustration: Figure 30

Comments: this structure is part of a larger village site, but was separated from this context on the basis of its decidedly different ceramic associations; the sherds collected from inside this structure suggest a period IB assignment, while the remainder of the QC68 sherds are fully conformable with a period IA placement; other possibilities include reoccupation of structure 68-2, or the occupation of this structure by "progressive" potters

QC Site Number: 75

Type of Site: ⬢ Period: II?

Architecture: two adjacent, thick-walled type III structures Illustration: Figure 20

Comments: only a few sherds are strewn around the structures; the dense pine litter may conceal a more extensive midden

Sites with a Single Structure of Type IV

QC Site Number: 83

Type of Site: ● Period: IA

Architecture: one type IV structure with a type X granary 10 meters to the southwest

Illustration: Figure 23

Comments: trash extends for 10 meters downslope from the major structure; the site is bordered on the south by a gully

QC Site Number: 16

Type of Site:  Period: IB?

Architecture: a single type IV structure Illustration: Figure 21

Comments: a few sherds occur in the immediate vicinity of the structure

QC Site Number: 11

Type of Site:  Period: II

Architecture: one type IV structure and a type III alcove house about 40 meters to the southeast

Illustration: Figure 22

Comments: a small number of sherds are scattered about the type IV structure; no sherds at all could be found in the vicinity of the alcove house; an east-trending gully is located about 20 meters north of the type IV structure

QC Site Number: 24

Type of Site:  Period: II

Architecture: a single type IV structure Illustration: Figure 21

Comments: a thin scatter of sherds extends 10 meters downslope from the structure

QC Site Number: 40

Type of Site:  Period: II?

Architecture: a single type IV structure Illustration: Figure 21

Comments: only a few sherds could be found in the vicinity of this structure; east-trending gullies are found 20 meters north and south of the structure

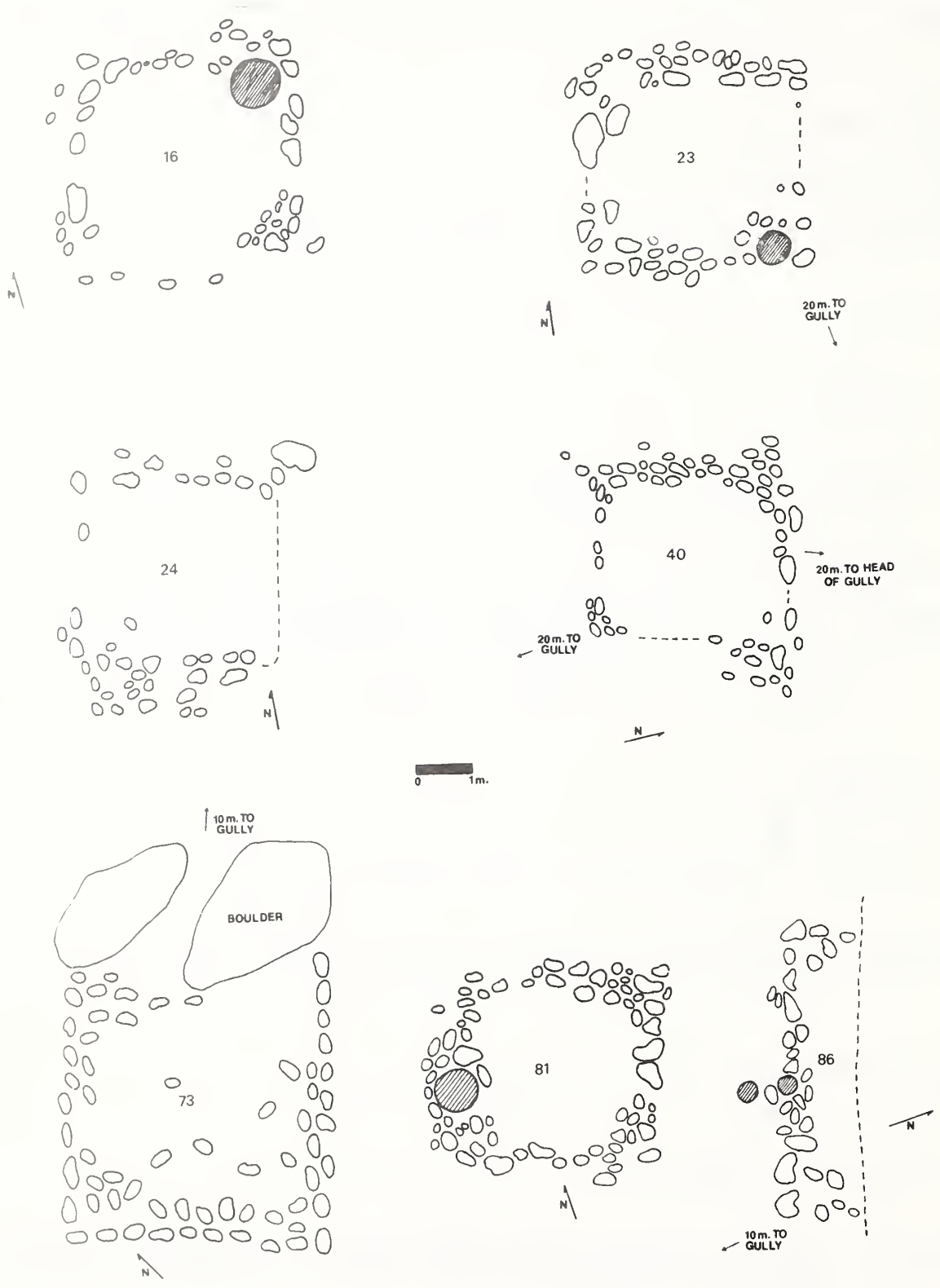


Figure 21. Plans for type IV structures.

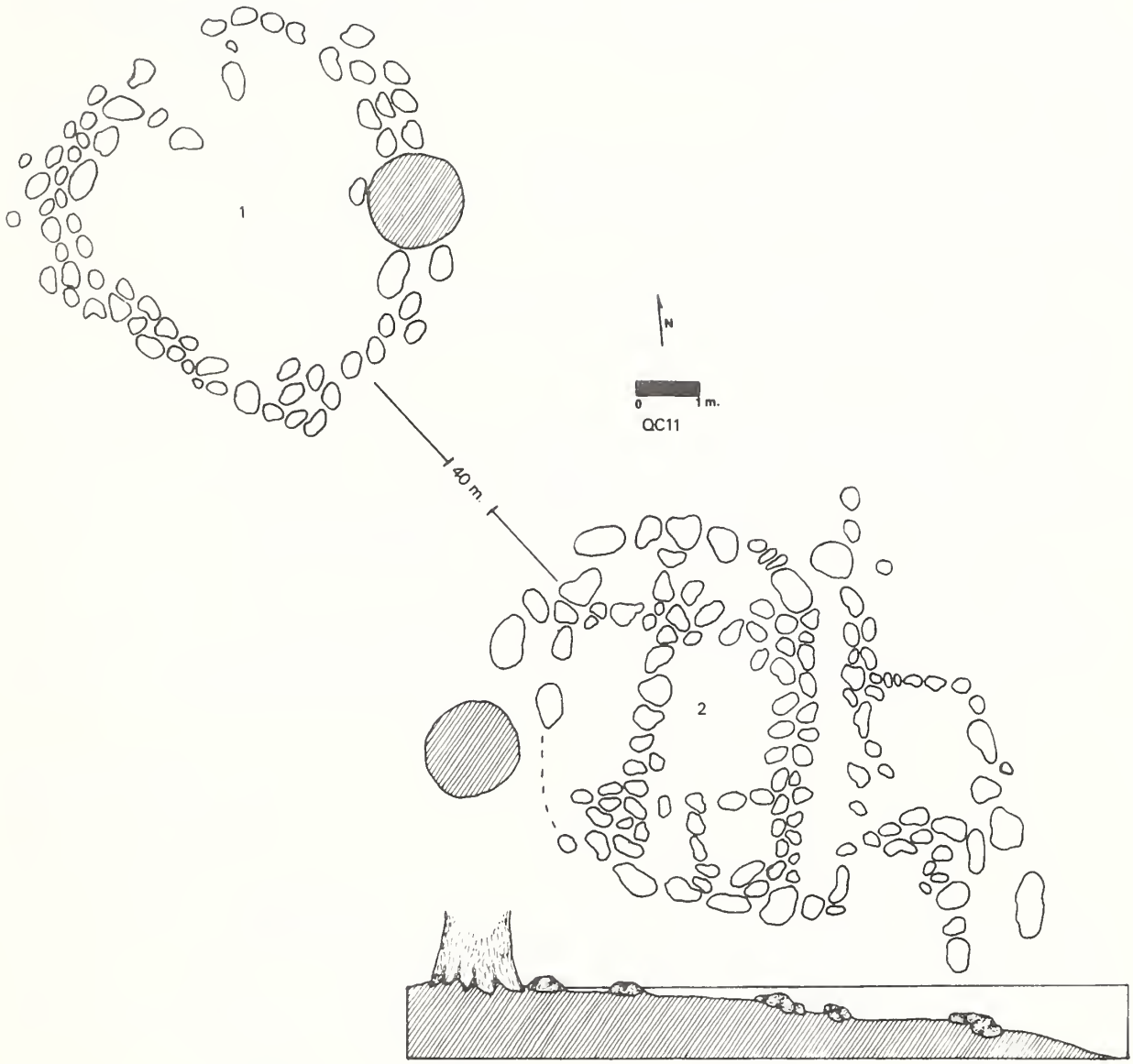


Figure 22. Plan of QC11.

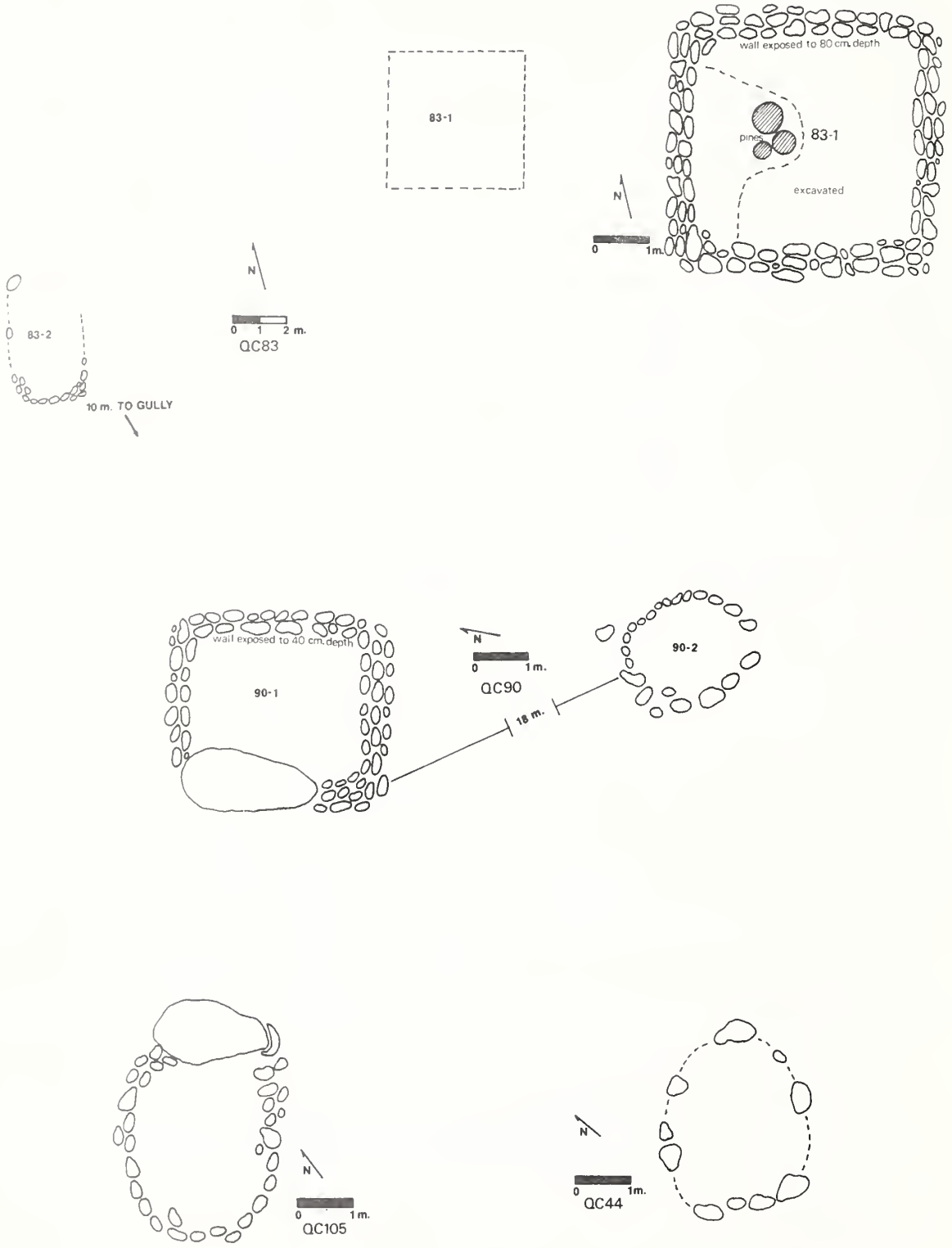


Figure 23. Plans for type IV structures with associated granaries (top and center) and isolated type IX granaries (bottom).

QC Site Number: 73

Type of Site: ● Period: II?

Architecture: a single type IV structure abutting two large boulders

Illustration: Figure 21

Comments: only a few sherds were found in the vicinity of this structure; an east-trending gully occurs 10 meters to the north

QC Site Number: 81

Type of Site: ● Period: II

Architecture: a single type IV structure Illustration: Figure 21

Comments: a few sherds are scattered around the structure

QC Site Number: 93

Type of Site: ● Period: II

Architecture: a type IV structure associated with two type IX granaries to the northeast

Illustration: Figure 24

Comments: a few sherds are scattered among the structures; an east-trending gully occurs 10 meters north of the site

QC Site Number: 23

Type of Site: ● Period: III

Architecture: a single type IV structure Illustration: Figure 21

Comments: a thick carpet of trash extends for 15 meters downslope from the structure

QC Site Number: 86

Type of Site: ● Period: III

Architecture: a single type IV structure cut through by a bulldozed fire-break

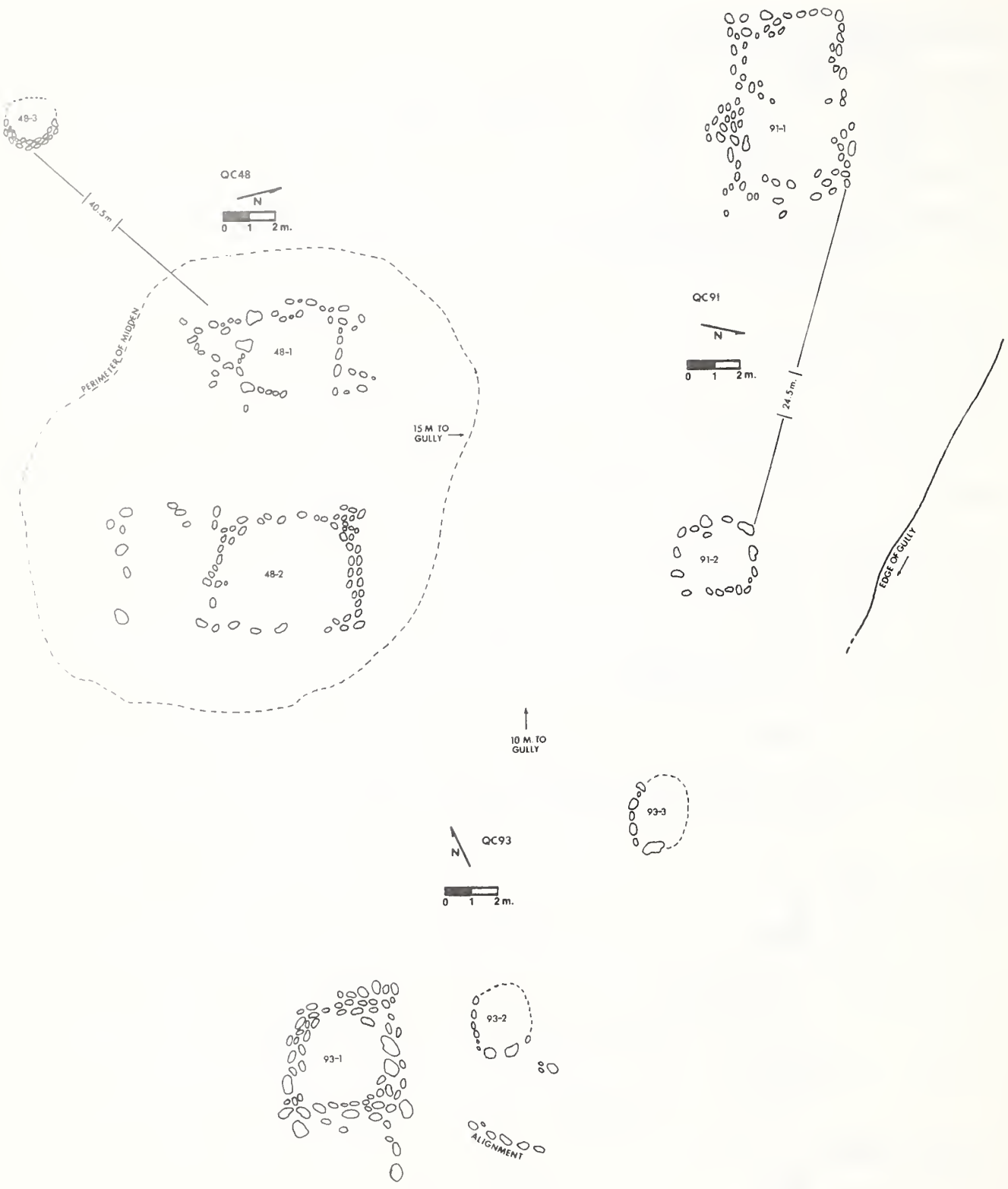


Figure 24. Plans for type V structures associated with granaries (top) and a type IV structure associated with granaries (bottom).

Illustration: Figure 21

Comments: sherds strewn over the swath of the bulldozer; an east-trending gully is found 10 meters to the south

QC Site Number: 90

Type of Site: ● Period: III?

Architecture: a type IV structure with a type IX granary located 18 meters to the southeast

Illustration: Figure 23

Comments: only a few sherds were found at this site

Sites with a Single Structure of Type V

QC Site Number: 88

Type of Site: ● Period: IB

Architecture: one type V structure Illustration: Figure 25

Comments: this site occupies a very peculiar position inside a gully bottom; sherds extend down the gully for about 20 meters; this situation suggests that the gully has not been active over the last millennium

QC Site Number: 48

Type of Site: ⬢ Period: II

Architecture: two adjacent structures, one of type V (48-2) and one of indeterminate type (48-1); a type IX granary is located about 40 meters southwest of this latter structure

Illustration : Figure 24

Commnets: the two major structures are associated with a rich midden covering an area of about 20 by 15 meters; an east-trending gully is found about 15 meters north of the site

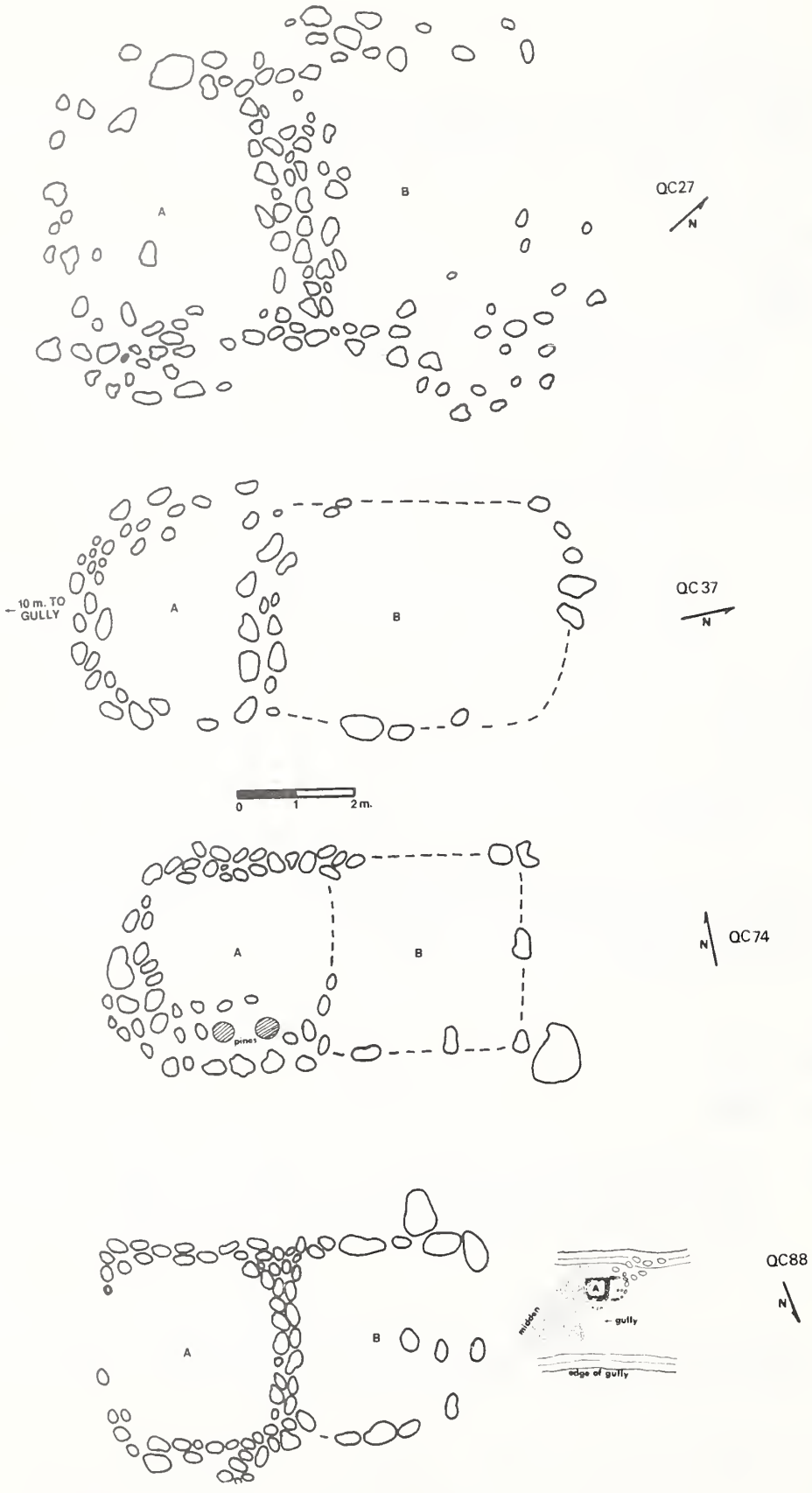


Figure 25. Plans for isolated type V structures.

QC Site Number: 74

Type of Site: ● Period: II

Architecture: one type V structure Illustration: Figure 25

Comments: a midden of sherds and spalls extends for 20 meters downslope from the structure

QC Site Number: 27

Type of Site: ● Period: III

Architecture: one type V structure Illustration: Figure 25

Comments: a rich midden extends 20 meters downslope from the structure

QC Site Number: 37

Type of Site: ● Period: III?

Architecture: one type V structure Illustration: Figure 25

Comments: only a few sherds were found, these exposed in a modern trail a few meters east of the structure

QC Site Number: 91

Type of Site: ● Period: III

Architecture: a type V structure with a type X granary located 25 meters to the east

Illustration: Figure 24

Comments: a scatter of sherds and spalls encompasses the two structures; an east-trending gully borders the site on the north

Sites with a Single Structure of Type VI

QC Site Number: 10

Type of Site: ● Period: II

Architecture: a single type VI structure; three large boulders are incorporated into the wall of room A

Illustration: Figure 26

Comments: sherds are common in the two rooms of the structure and extend for 25 meters downslope

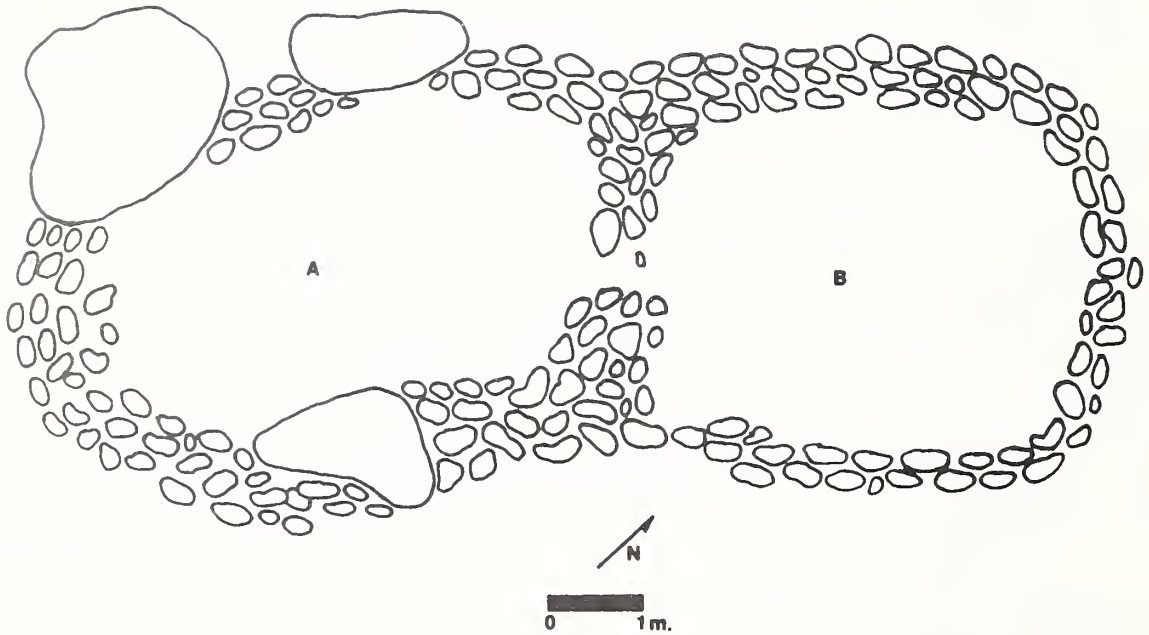


Figure 26. The Type VI Structure at QC10.

Sites with a Single Structure of Type VII

QC Site Number: 18

Type of Site: Period: IB?

Architecture: a single type VII structure Illustration: Figure 27

Comments: only a few sherds were found in the vicinity of the structure; a south-trending gully is located 10 meters to the east

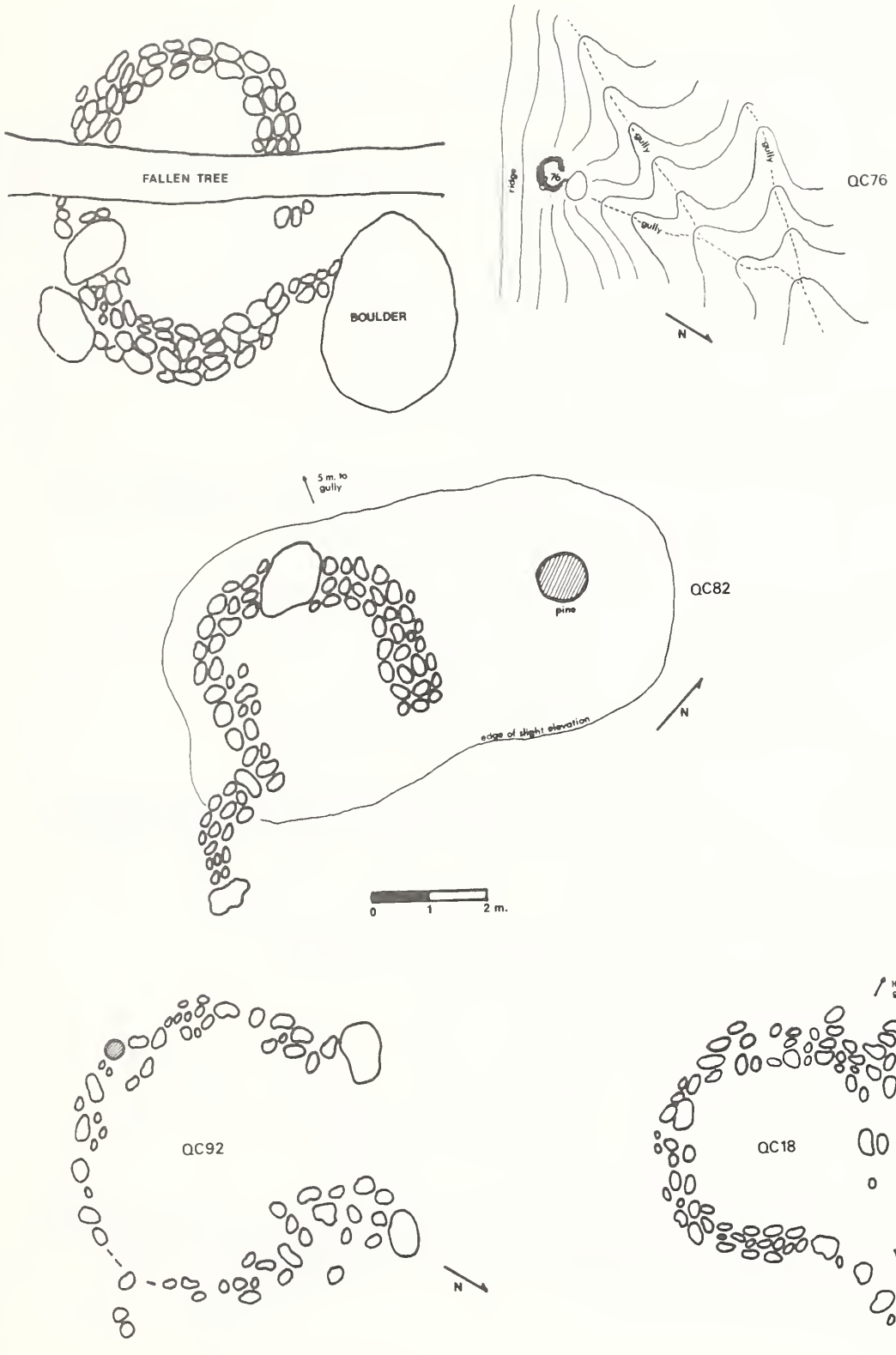


Figure 27. Plans for isolated type VII structures.

QC Site Number: 92

Type of Site: ● Period: IB

Architecture: one type VII structure Illustration: Figure 27

Comments: a rich midden laden with sherds and spalls in the immediate vicinity of the structure

QC Site Number: 76

Type of Site: ● Period: II

Architecture: one type VII structure Illustration: Figure 27

Comments: the structure is situated on a ridge which slopes down to the heads of several gullies; sherds are sparsely scattered downslope from the structure

AC Site Number: 82

Type of Site: ● Period: II?

Architecture: one type VII structure Illustration: Figure 27

Comments: the structure is placed on a small natural eminence located 5 meters east of a gully; only a few sherds were found around the structure

Sites with One or Two Type VIII Structures

QC Site Number: 39

Type of Site: ● Period: II

Architecture: one type VIII structure Illustration: Figure 28

Comments: a few sherds are found around the structure and downslope; the site is situated at the edge of a grassy clearing

QC Site Number: 42

Type of Site: ● Period: II

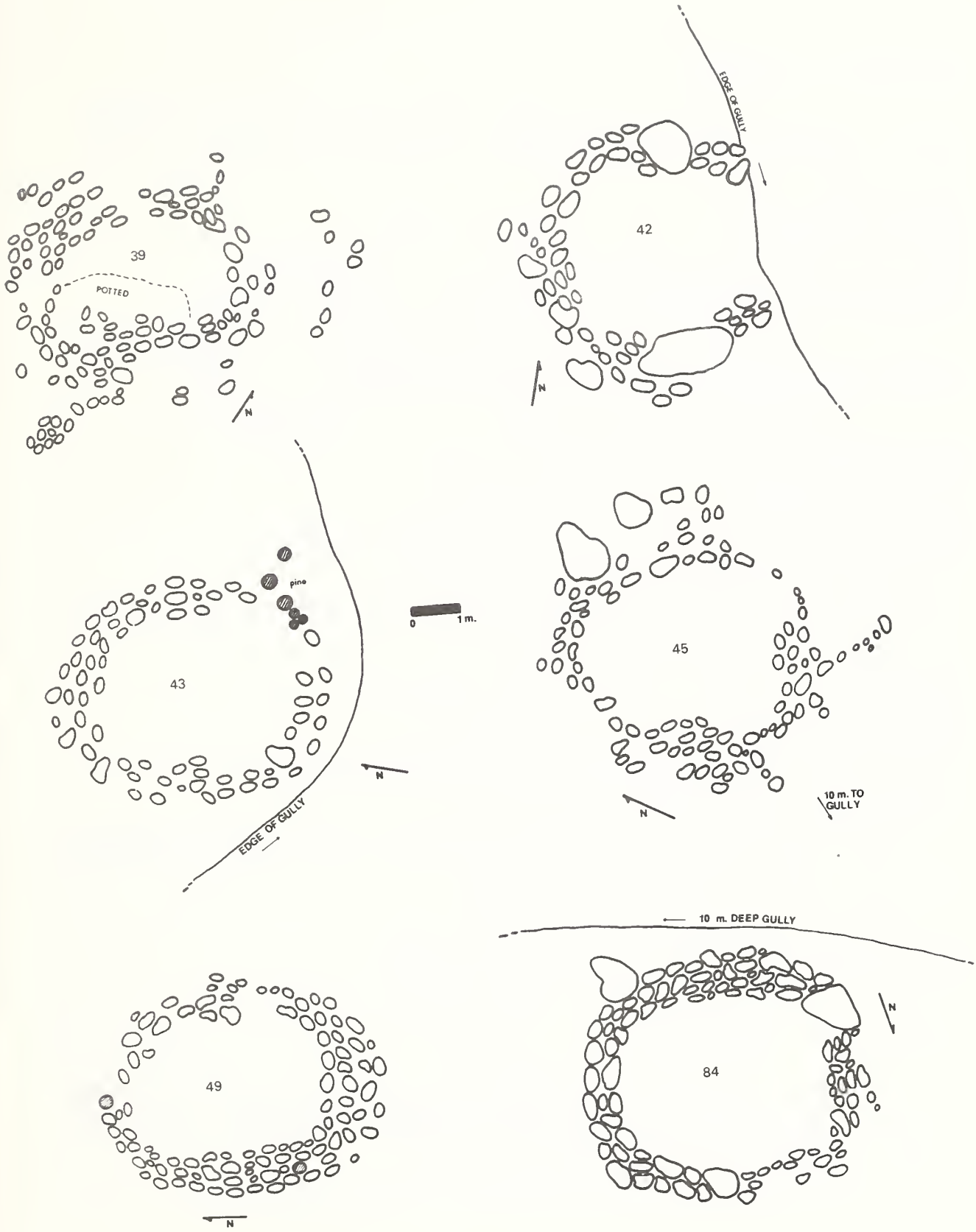


Figure 28. Plans for isolated type VIII structures.

Architecture: one type VIII structure Illustration: Figure 28

Comments: only a few sherds were found around the structure; the eastern wall of the structure appears to have been cut away by a gully

QC Site Number: 45

Type of Site: ● Period: II?

Architecture: one type VIII structure Illustration: Figure 28

Comments: a few sherds were found inside the structure; an east-trending gully is found 10 meters to the southwest

QC Site Number: 49

Type of Site: ● Period: II

Architecture: one type VIII structure Illustration: Figure 28

Comments: a few sherds were found around the structure and downslope

QC Site Number: 87

Type of Site: ⬢ Period: II

Architecture: two adjacent type VIII structures Illustration: Figure 29

Comments: trash is restricted to the immediate vicinity of the structures

QC Site Number: 84

Type of Site: ● Period: III

Architecture: one type VIII structure Illustration: Figure 28

Comments: the structure is perched on the northern edge of a 10 meters deep gully; a large number of sherds are exposed on the gully bank immediately below the structure

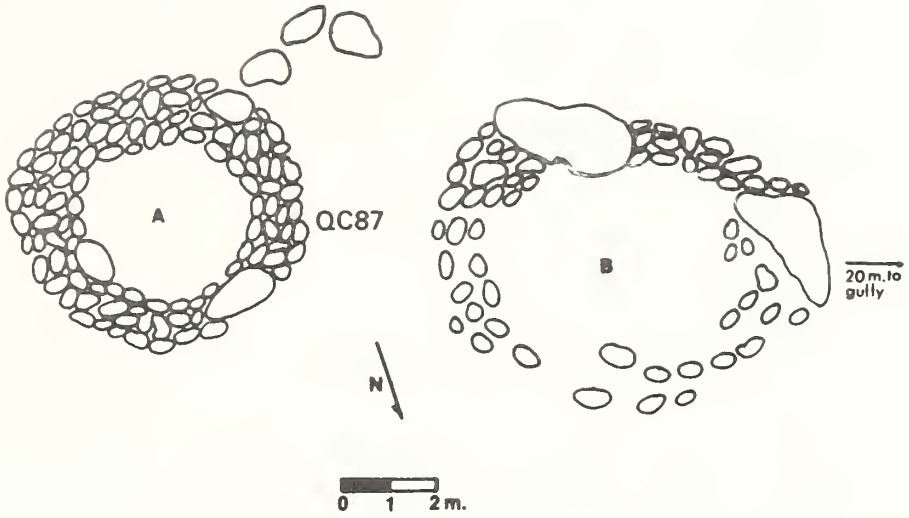


Figure 29. Plan of QC87.

Site with Isolated Type IX Granaries

QC Site Number: 44

Type of Site: O Period: IB

Architecture: one type IX granary Illustration: Figure 23

Comments: a few sherds and spalls occur in the vicinity of the structure

QC Site Number: 105

Type of Site: O Period: IB

Architecture: one type IX granary Illustration: Figure 23

Comments: a few sherds are found immediately north of the structure; the site is situated in a clearing bordered by ponderosa pine

QC Site Number: 152

Type of Site: O Period: IB

Architecture: one type IX granary Illustration: none

Comments: the southern wall of this structure has been cut into by a gully; sparse trash around the structure

Village Sites (three or more structures excluding granaries)

QC Site Number: 68

Type of Site: □ Period: IA

Architecture: three structures: type II (2), type VII(1) Illustration: Figure 30

Comments: a dense midden measuring 50 by 25 meters surrounds the two northern structures (68-1, 68-3); 68-4 and its associated midden are located about 30 meters to the southeast; a gully borders the site on the east

QC Site Number: QC50+151

Type of Site: □ Period: IA

Architecture: four structures: type II (3), type IX granary (1) Illustration: Figure 29

Comments: the structures are situated on the edge of a large clearing dotted with sherds; nearby gullies occur to the east.

QC Site Number: 153

Type of Site: □ Period: IA

Architecture: nine structures: type II (3), type III (1), type IX granary (1), indeterminate (4); two possible checkdams are also present

Illustration: see DeBoer (1976)

Comments: this site is fully described in DeBoer (1976)

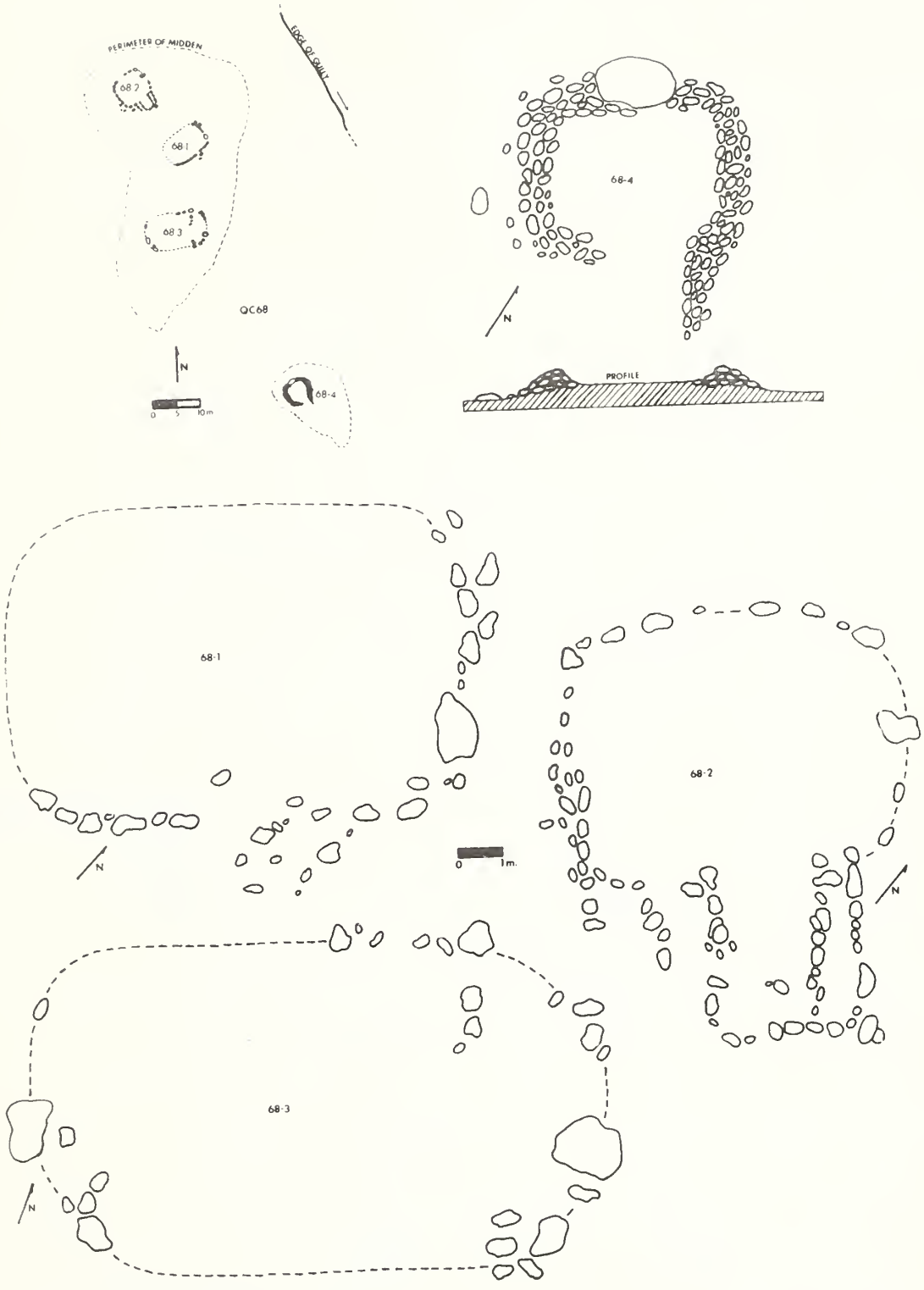


Figure 30. Plan of QC68 (upper left) and of individual structures shown at enlarged scale.

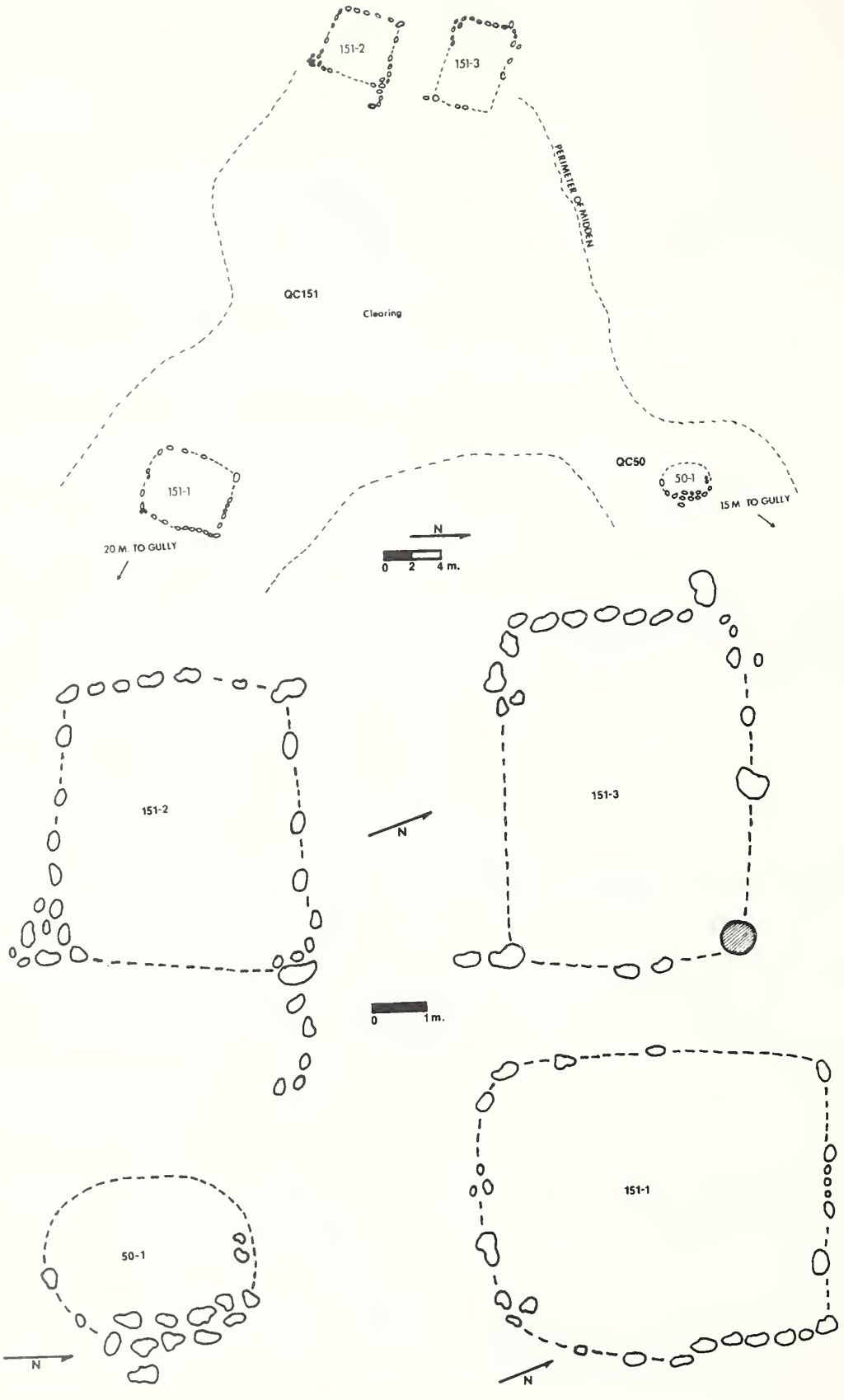


Figure 31. Plan of QC50+151 (top) and of individual structures shown at enlarged scale (below).

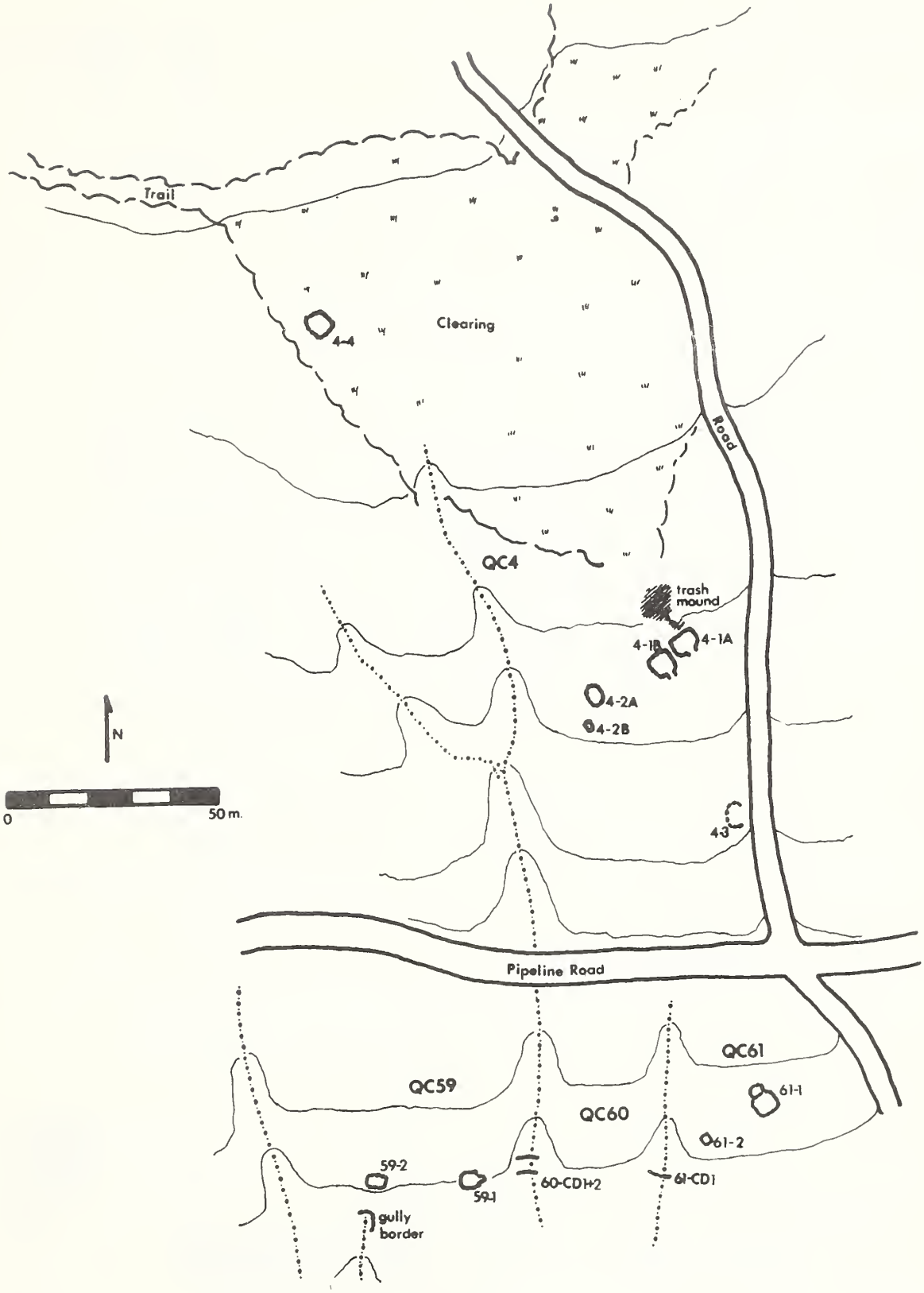


Figure 32. Site plan for QC4 and QC59-61.

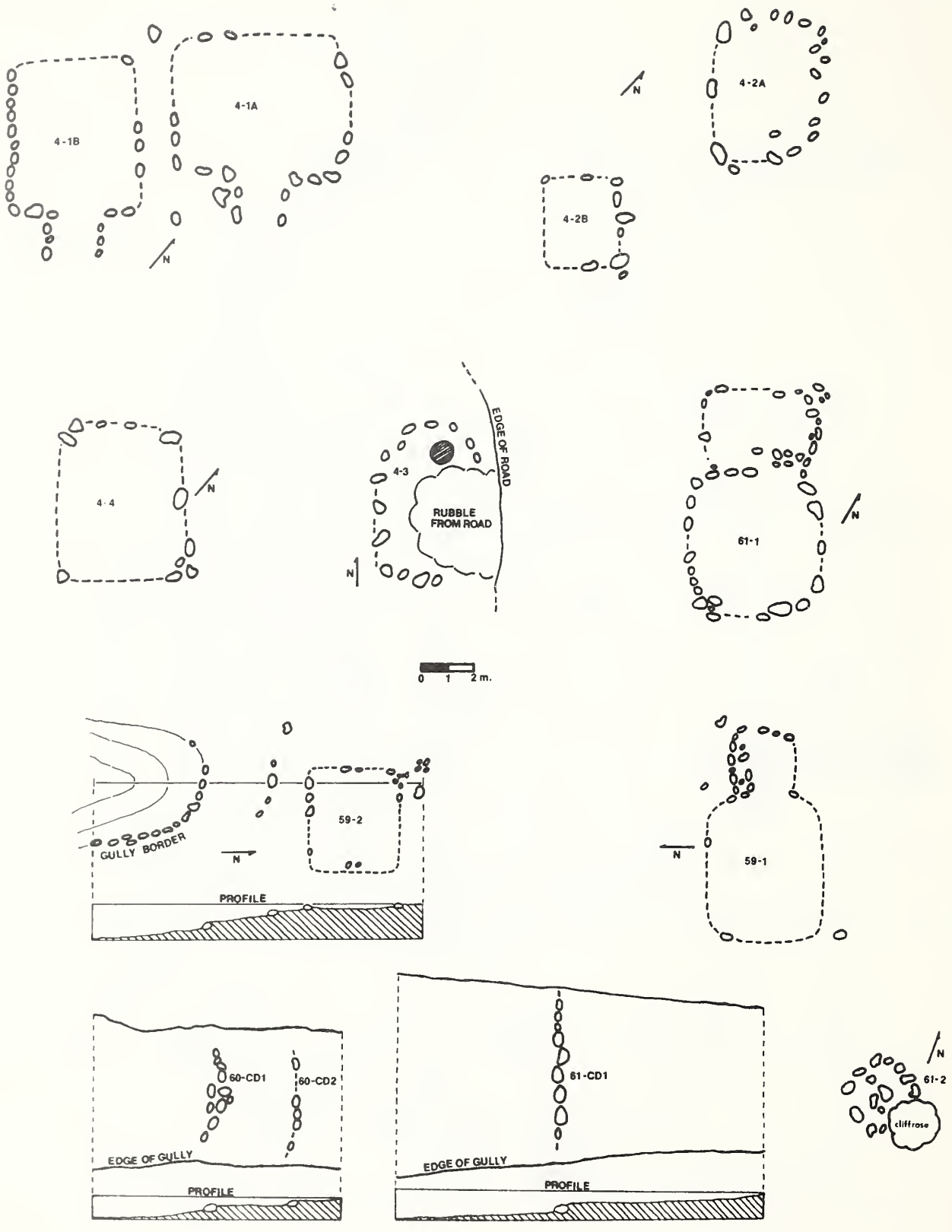


Figure 33. More detailed plans for structures plotted in Figure 32.

QC Site Number: QC4-surface and QC59-61

Type of Site: ☐ Period: IA

Architecture: four structures: type II (1), type III (1), type V (1), and a type IX granary; three checkdams and one so-called gully border are also associated with the occupation

Illustration: Figures 32-33

Comments: QC4 and QC59-61, originally recorded as separate sites, are actually part of one immense sherd scatter stretching for 300 meters north to south and at least 100 meters east to west; the density of settlement in this area is probably attributable to the proximity of Elden Spring a few hundred meters to the northeast; careful inspection of the sherds found in the vicinity of each structure suggests the presence of two separate occupations: (1) a period IA occupation including structure 4-4 and the adjacent sherd scatter covering a large grassy clearing, as well as the four structures and associated checkdams of QC59-61 which occur south of Pipeline Road (Figure 32); (2) a period IB occupation including structures 4-1, 4-2, and 4-3 (considered below); details of these structures are shown in Figure 33; one unique feature associated with the earlier occupation is a rock alignment bordering the head of a gully; it appears that this gully border was designed to retard headward expansion of the gully toward structure 59-2.

QC Site Number: 4-1, 2, 3

Type of Site: ☐ Period: IB

Architecture: five structures: type II (2), type III(2), and a type X granary

Illustration: Figures 32-33

Comments: the two large alcove houses are associated with a trash mound immediately to the north; structure 43 has been cut through by a modern road

QC Site Number: 7

Type of Site: ☐ Period: IB

Architecture: four type II structures Illustration: Figure 34

Comments: the structures are located at the edge of a large clearing bordered on the east by a gully; sherds are found throughout this clearing

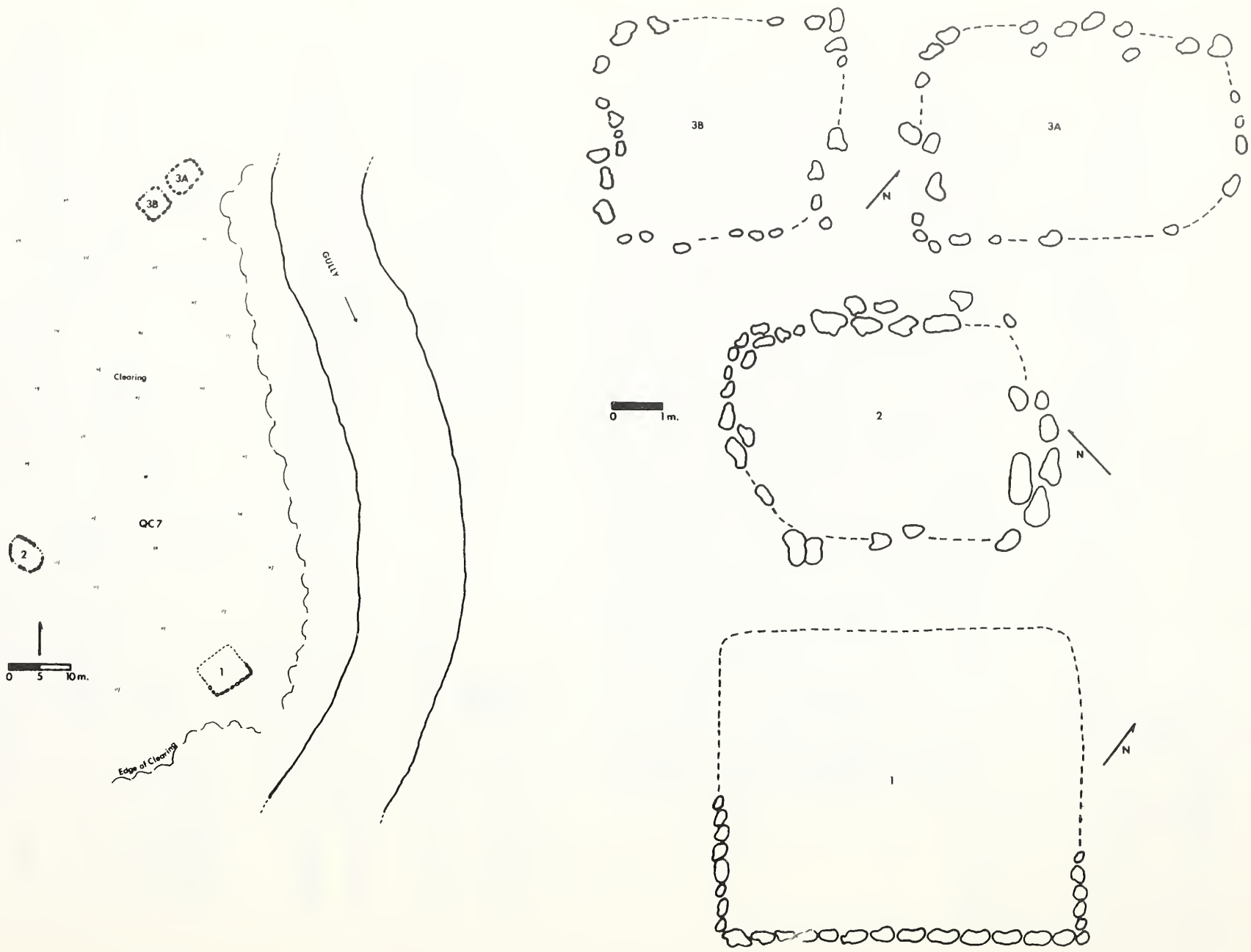


Figure 34. Plan of QC7.

QC Site Number: 28 (originally recorded as QC28-29)

Type of Site: ☐ Period: III

Architecture: eleven structures: type I (1), type II (3), type IV (2), type VI (1), type IX granaries (2), and type X granaries (2); three probable checkdams are also present; details of these structures are shown in Figures 36-37

Illustration: Figures 35-37

Comments: as shown in Figure 35, sherds and spalls are scattered over a large area, their density increasing in the immediate vicinity of structures; of note is the great deal of architectural diversity at this site and the large size of several of the structures

Multi-roomed Structures or Pueblitos

QC Site Number: 85

Type of Site: ◪ Period: II

Architecture: one multi-roomed structure Illustration: Figure 38

Comments: this structure is located on a ridge defined by two east-trending gullies; sherds are abundant around the structure and extend into the gullies

QC Site Number: 31

Type of Site: ◪ Period: III

Architecture: two room blocks and a terraced plaza partially bordered by cobbles

Illustration: Figure 39

Comments: this eleven room pueblito is perched on a steep-sided peninsula of land composed of Kaibab limestone which juts out from the eastern base of Elden Mountain; this location affords a panoramic view of the lower lands to the east; sherds are extremely abundant around the structures and plaza and extend downslope

QC Site Number: 101

Type of Site: ◪ Period: III

Architecture: five room structure Illustration: Figure 40

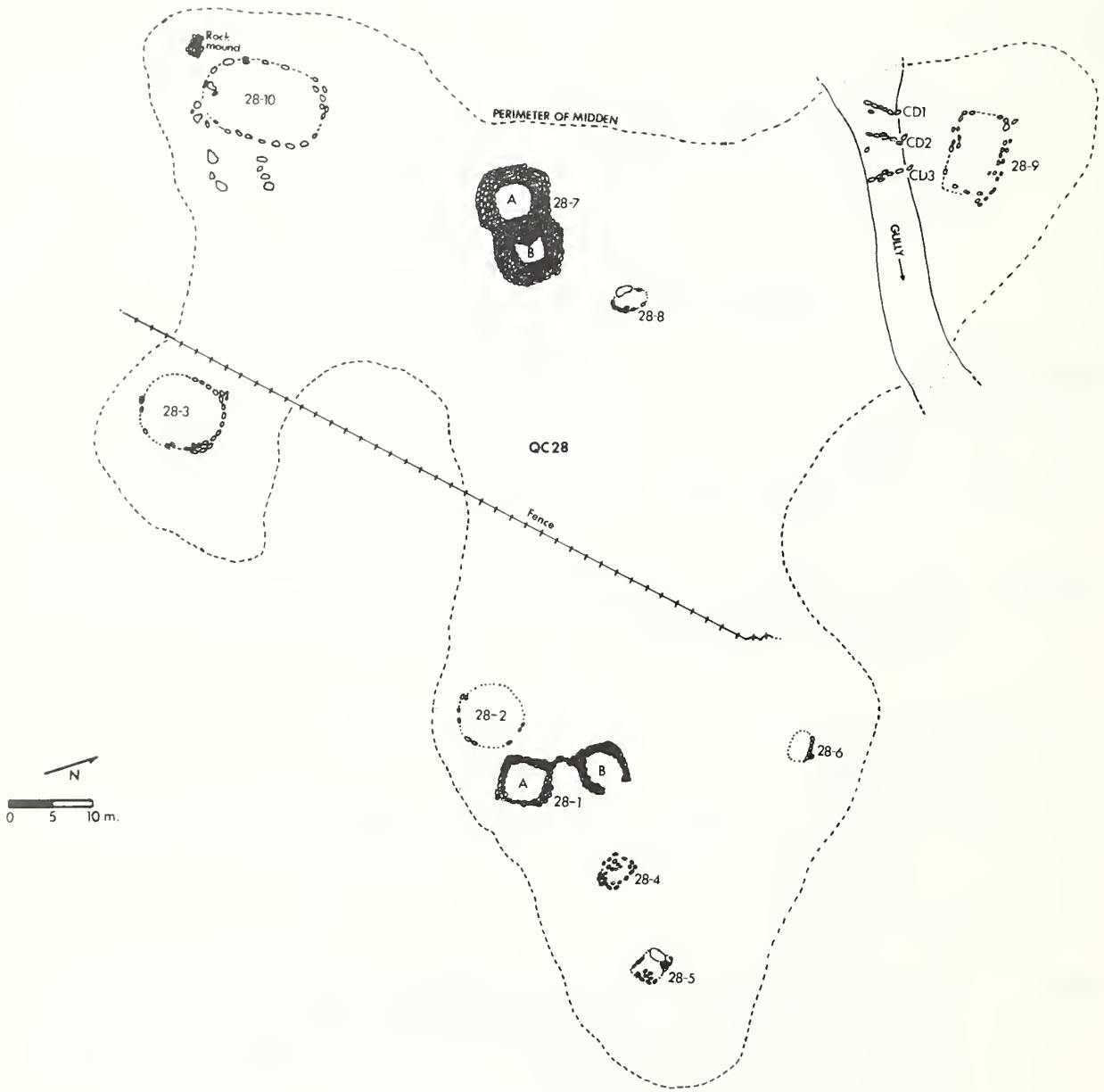


Figure 35. Plan of QC28.

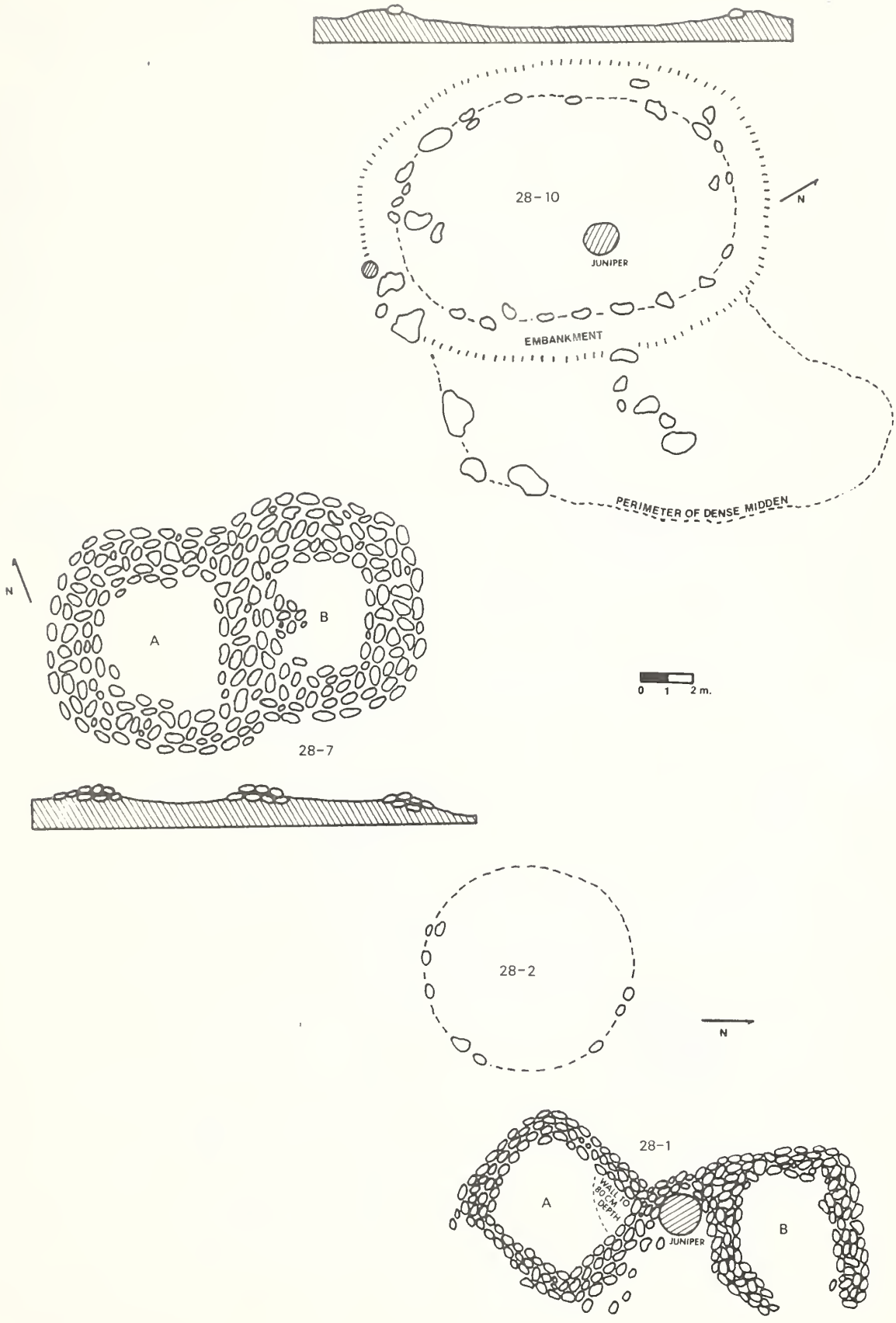


Figure 36. More detailed plans for structures plotted in Figure 35.

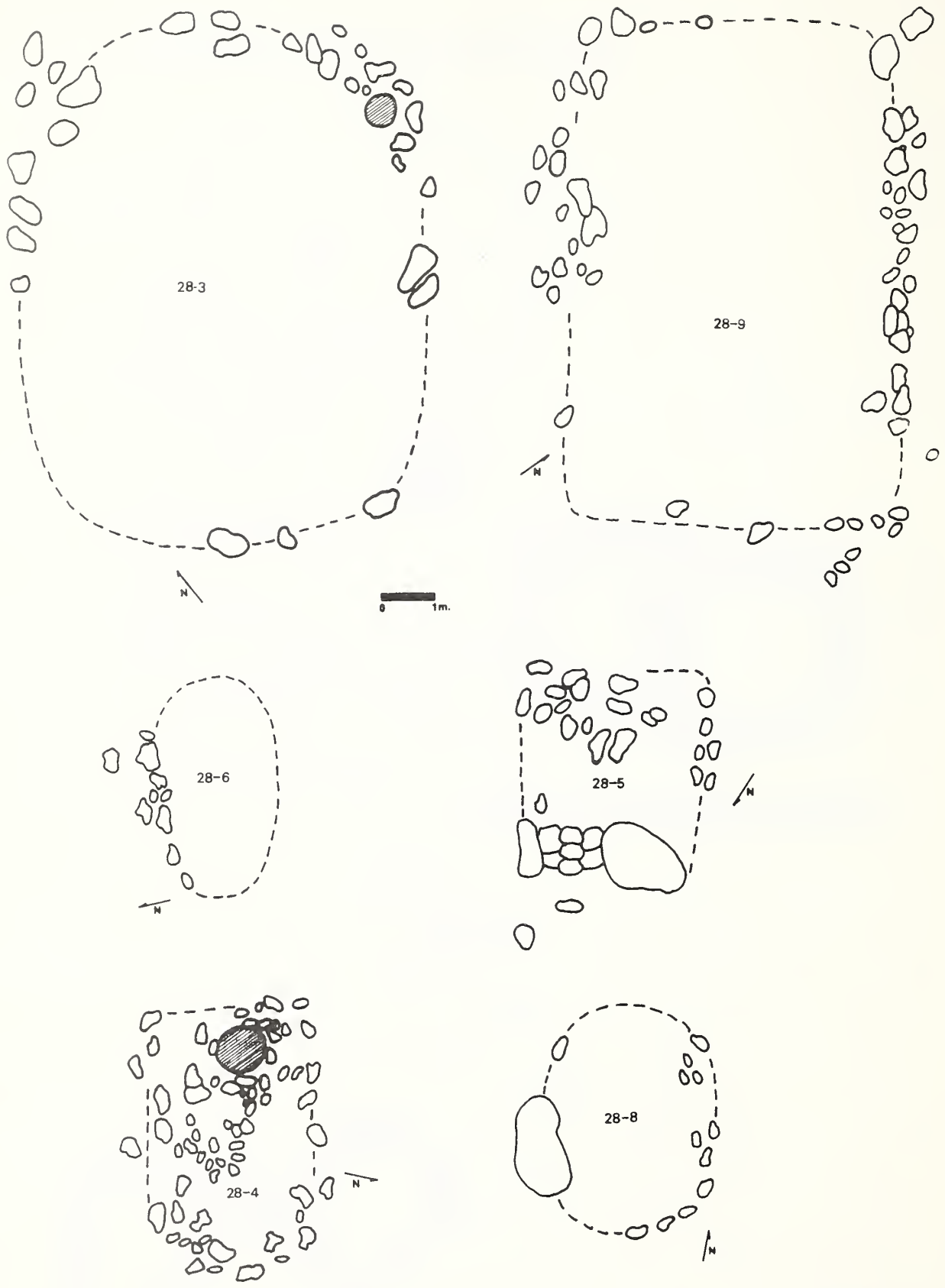


Figure 37. More detailed plans for structures plotted in Figure 35.

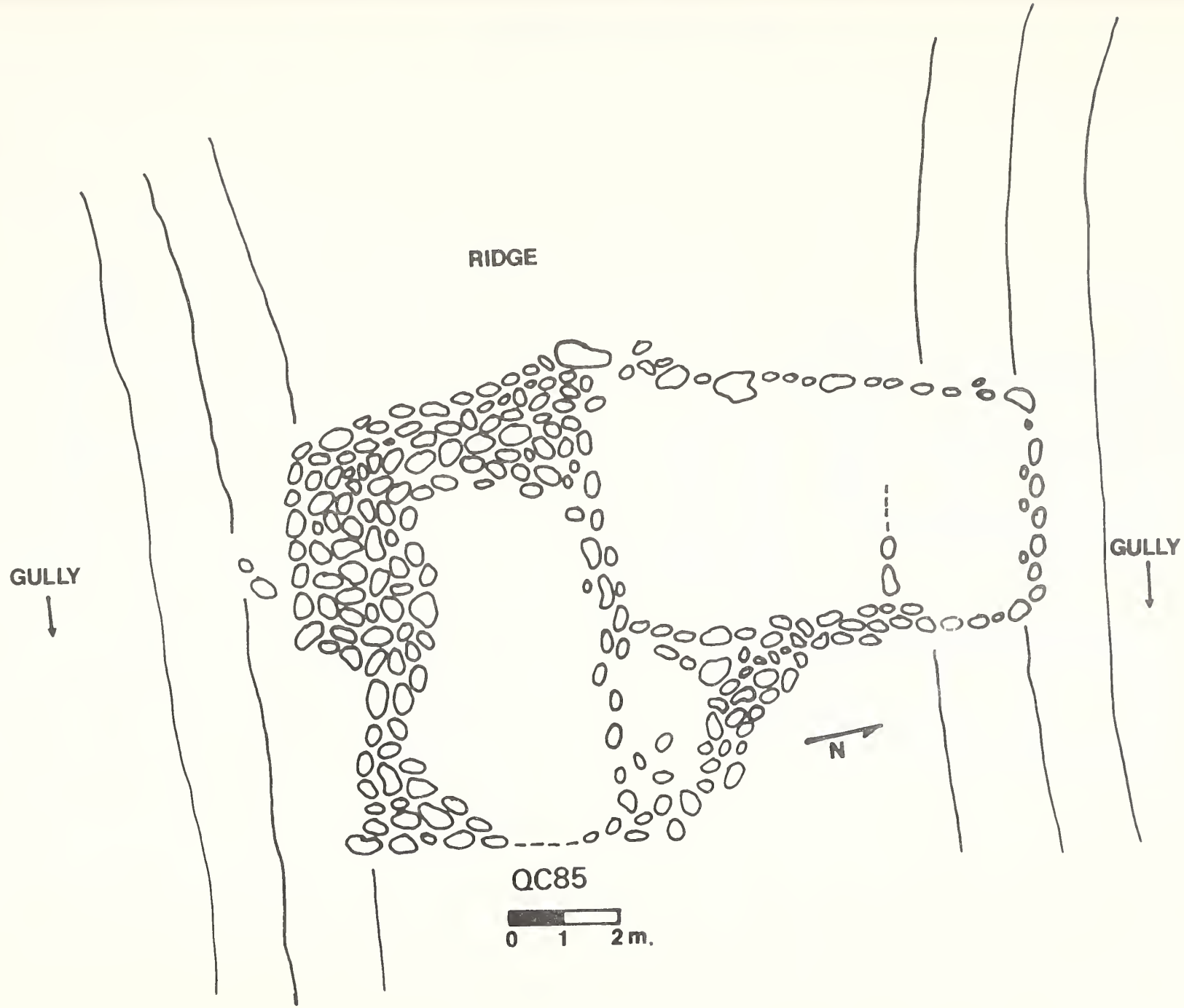


Figure 38. Plan of QC85.

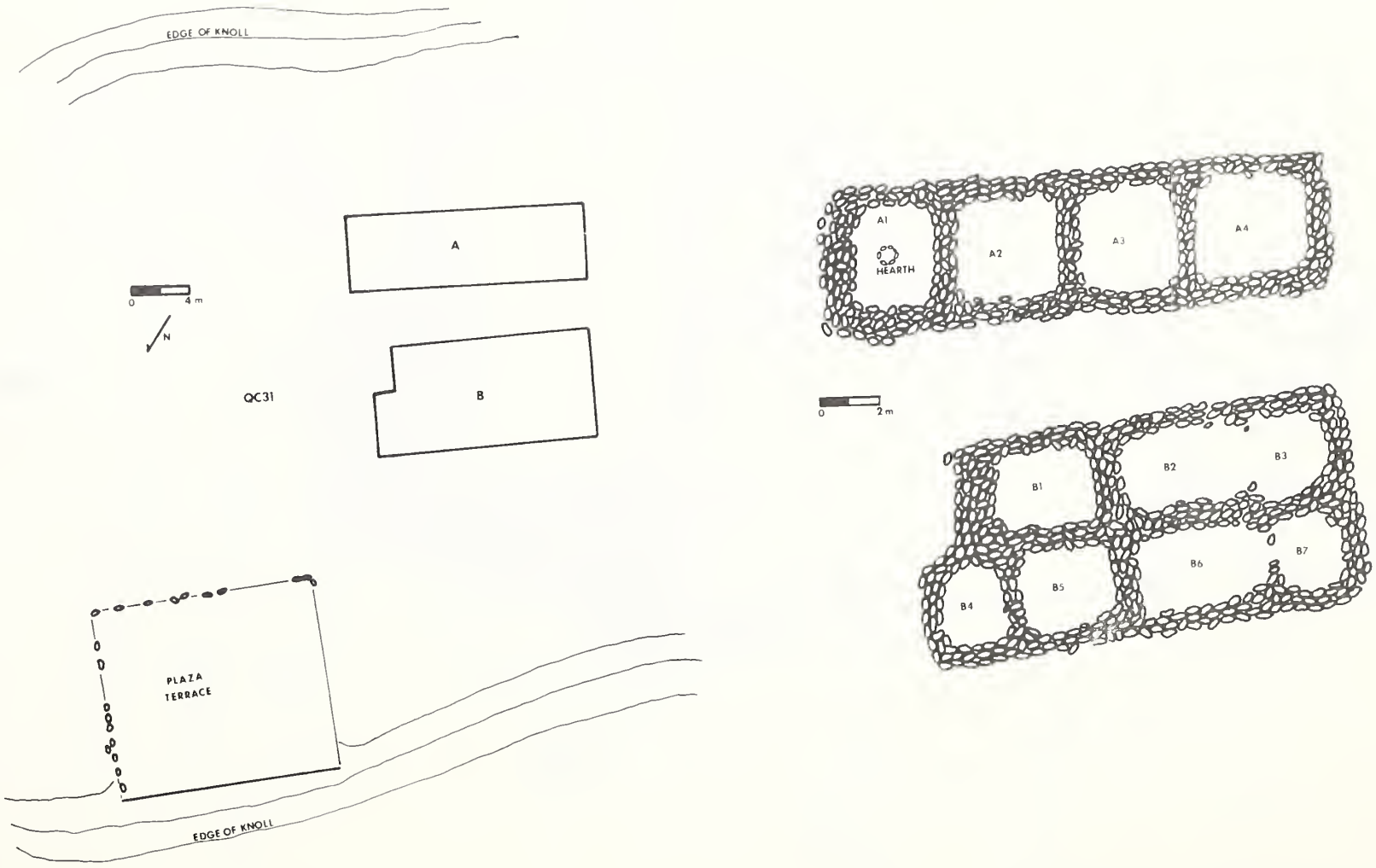


Figure 39. Plan of QC31

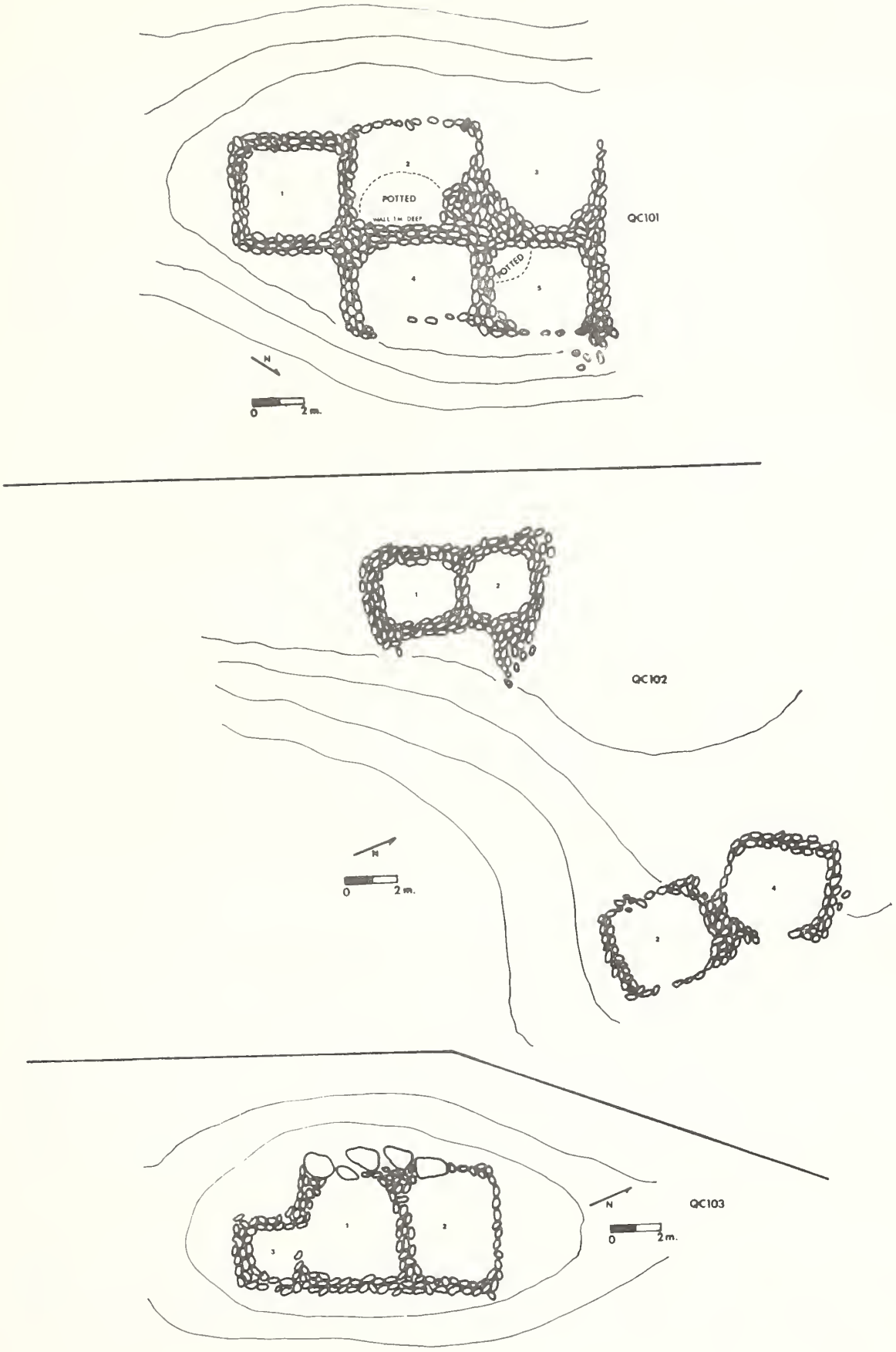


Figure 40. Plans for QC101, 102, and 103.

Comments: QC101, 102, and 103 are perched atop three successive steep-sided hills at the northern extremity of the survey area; these hills, composed of Coconino sandstone and Kaibab limestone, are connected by saddles, and the three sites may well be part of the same prehistoric community; to the west, they overlook an extensive sandy meadow and QC100 which separates them from the base of Elden Mountain; to the east, they command an excellent view of the gently sloped flanks of Elden Mountain; the sites are somewhat difficult of access and apart from the picturesque view, defensive considerations, and the abundance of limestone construction material they would seem to be rather inconveniently located.

QC Site Number: 102

Type of Site: ☒ Period: III

Architecture: two two-room structures Illustration: Figure 40

Comments: sherds cover the hill top and extend down the steep slopes

QC Site Number: 103

Type of Site: ☒ Period: III

Architecture: one three-room structure Illustration: Figure 40

Comments: see QC101-102

Artifacts

The following discussion is selective and brief. Potsherds dominate the artifact collections made during the survey. In an earlier section, these potsherds were examined with the purpose of establishing a chronology based on ceramic types. Here we will focus on rim sherds in an attempt to define the major vessel shapes represented in the ceramic collections. After all, good potters make pots and not potsherds, and it is the ceramic vessel which assumes behavioral reality in its use in cooking, storage, or the serving of foods. Our procedures for reconstructing vessel shape from rim sherds have been described and evaluated elsewhere (DeBoer, 1980).

Vessel Shapes

General Jars: Necked vessels with globular bodies executed in Alameda Brown Ware or San Francisco Mountain Grey Ware (Figure 41). This is the most common vessel category, constituting 36 to 53 percent of the rim

sherds in all periods and in all settlement types (Table 14). Rim diameter ranges widely from 12 to 30 centimeters (Tables 15 and 16). Through time, there appears to be a shift from markedly flaring to nearly vertical rims as well as a trend from rounded to squared lips (Table 17).

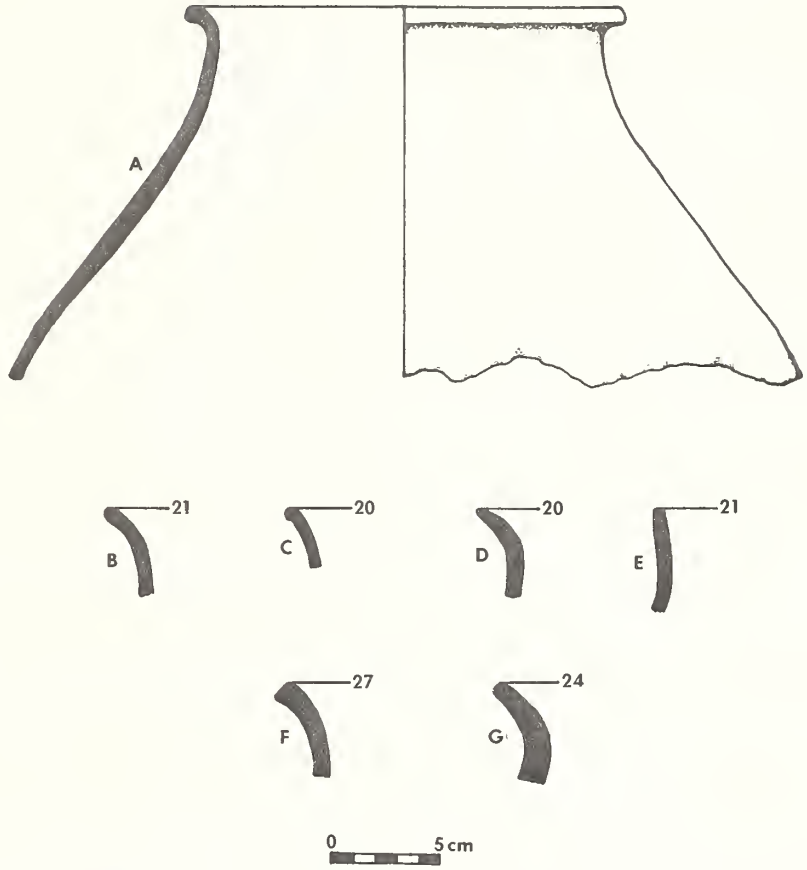


Figure 41. General jars: A. QC154-2, floor (Angell Brown), B. QC151 (Rio de Flag Brown), C. QC35 (Rio de Flag Brown), D. QC28 (Angell Brown), E. QC101 (Winona Brown), F. QC103 (Winona Brown), G. QC31 (Winona Brown).

Tusayan Gray Jars: Of the few Tusayan Gray rim sherds, in only one case is it possible to offer a reconstruction of the entire vessel. This vessel has a deep globular body and a tall gently flared neck (Figure 42). Other examples of Tusayan Gray jars from the survey area are illustrated in DeBoer (1976: Figures 26K, 27A-B).

Seed Jars: Commonly known as "seed jars" or "seed bowls" in Southwestern ceramic parlance, these vessels constitute a minor part of the vessel inventory in all periods (Table 14). The three examples with determinable diameters are illustrated in Figure 43 K-M.

General Bowls: Open bowls which are most commonly flaring (Figure 43 A-C) but range continuously to a vertical or slightly incurving profile (Figure 43 D-E). These vessels, made of Alameda Brown Ware, form a rather consistent 25 percent of the rim sherds in all periods and in all settlement

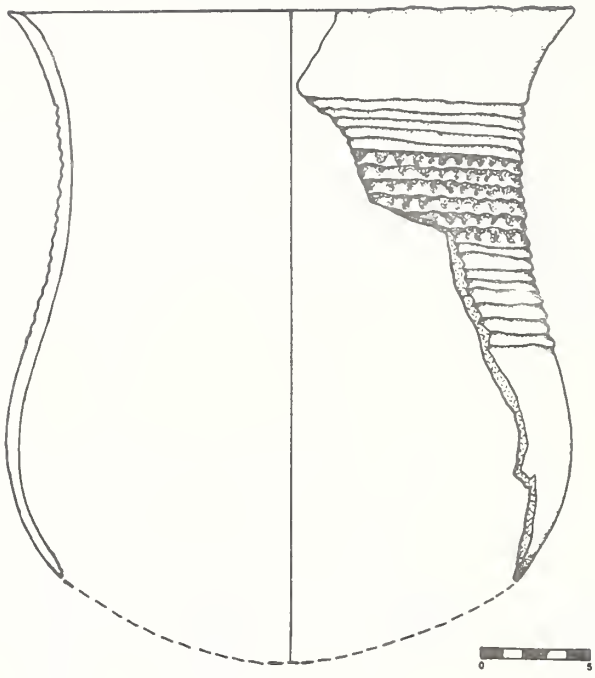


Figure 42. Tusayan Gray jar, QC154-2, floor of pithouse.

types (Table 14). Rim diameters range from 12 to 28 centimeters with most falling between 16 and 25 centimeters (Tables 15 and 16). Within this form, a markedly flaring profile is restricted to periods IA-IB, while a squared lip increases in frequency from perod IA through Period III (Table 18).

Recurved Bowls: A probable variant of the general bowl having a gracile recurved profile (Figure 43 J). The vessel walls are usually more carefully smoothed than in the case of general bowls. Recurved bowls have a representation in all periods and in most settlement types (Table 14).

Painted Bowls: Hemispherical bowls with the interiors painted in black-on-white or, more rarely, black-on-red. Examples from the survey area are illustrated in DeBoer (1976: Figures 20-22) and in DeBoer and Billeck (1976: Figures 5 A-G, 6A-B). These vessels, which are generally regarded to be imports to the Flagstaff area from the Kayenta Anasazi, are well represented in all time periods and in most settlement types (Table 14). Although rim diameters range widely most concentrate between 16 and 20 centimeters (Tables 15 and 16). In this respect, these vessels vary much less than the locally produced general bowls. It is not known whether this reduced variability reflects the effects of the local Sinagua "market" or is a general characteristic of painted bowls produced in the Kayenta area.

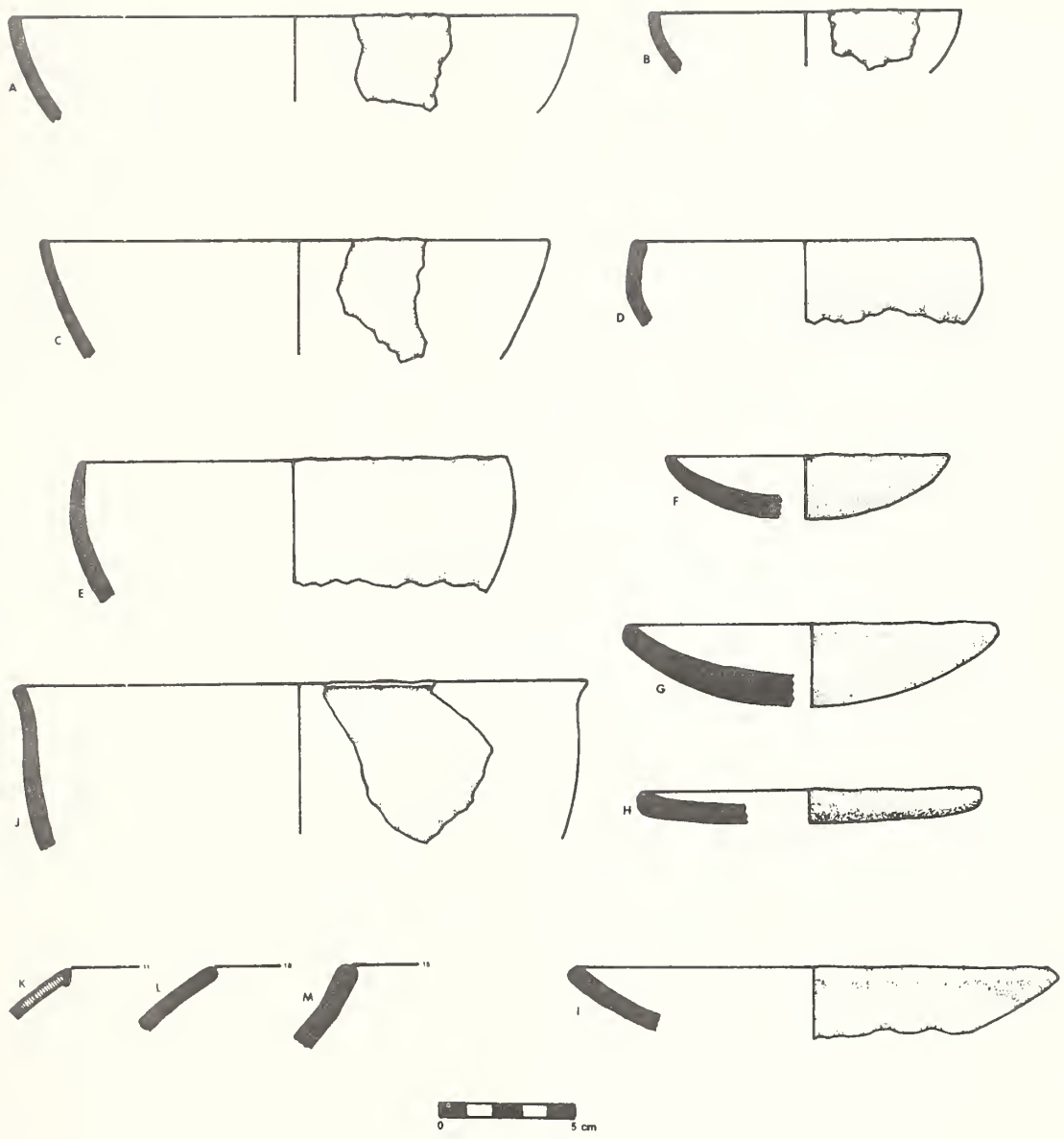


Figure 43. General bowls: A. QC104 (Rio de Flag Brown), B. QC4 (Rio de Flag Brown), C. QC88 (Sunset Brown), D. QC151 (Angell Brown), E. QC32 (Angell Brown); Plates: F. QC17 (Rio de Flag Brown), G. QC22 (Rio de Flag Brown), H. QC85 (Angell Brown), I. QC41 (Rio de Flag Brown); Recurved Bowl: J. QC26 (Angell Brown); Seed Jars: K. QC7 (Deadmans Gray), L. QC70 (Angell Brown), M. QC26 (Winona Brown)

Table 14. Distribution of rim sherds from major vessel shapes by period (top) and by settlement type (bottom

	General Bowl	Painted Bowl	Recurved Bowl	Plate	General Jar	Tusayan Gray Jar	Seed Jar	Total
IA	20 26%	9 12%	5 7%	5 7%	33 43%	3 4%	1 1%	76
IB	21 24%	16 19%	3 3%	6 7%	35 41%	2 2%	3 3%	86
II	32 28%	19 17%	6 5%	5 4%	41 36%	7 6%	4 4%	114
III	37 28%	18 14%	2 2%	2 2%	70 53%	2 2%	2 2%	133
TOTAL	110	62	16	18	179	14	10	409
▨	20 28%	11 15%	1 1%	1 1%	36 51%	2 3%	- -	71
□	23 24%	12 13%	3 3%	6 6%	46 48%	2 2%	3 3%	95
⬡	7 (33%)	3 (14%)	1 (5%)	1 (5%)	7 (33%)	2 (10%)	- -	21
⬢	4 (25%)	5 (31%)	- -	- -	7 (44%)	- -	- -	16
○	13 (41%)	4 (13%)	2 (6%)	1 (3%)	10 (31%)	- -	- -	32
●	18 28%	6 9%	5 8%	3 5%	32 49%	- -	1 2%	65
△	20 20%	20 20%	4 4%	5 5%	38 38%	8 8%	4 4%	99
▲	4 (57%)	- -	- -	1 (14%)	2 (29%)	- -	- -	7
⊙	1 (50%)	1 (50%)	- -	- -	- -	- -	- -	2
TOTAL	110	62	16	18	178	14	10	408

Table 15. Rim diameters of major vessel shapes by ceramic type.

	Rim diameter cm.			
	11-15	16-20	21-25	26-30
General jars				
Rio de Flag Brown	3	6	9	3
Angell Brown	4	15	8	2
Winona Brown	1	4	7	5
San Francisco Mt. Gray Ware	2	2	1	2
General bowls				
Rio de Flag Brown	2	5	3	1
Angell Brown	3	5	5	0
Winona Brown	0	1	2	2
Painted bowls	2	24	6	2

Table 16. Rim diameters of major vessel shapes by period.

	Rim diameter cm.			
	11-15	16-20	21-25	26-30
General jars				
IA	3	4	6	4
IB	3	5	5	2
II	3	4	4	2
III	1	14	9	4
General bowls				
IA	2	3	3	1
IB	1	6	3	0
II	1	2	2	0
III	1	2	4	2
Painted bowls				
IA	0	2	1	0
IB	0	7	3	1
II	0	10	0	0
III	2	5	2	1

Table 17. Distribution by period of selected features of general jars.

	IA		IB		II		III	
	#	%	#	%	#	%	#	%
Wall Thickness 3 cm. Beneath the Lip								
Thin (<5 mm.)	5	19	6	17	7	21	9	13
Medium (5-10 mm.)	22	81	28	78	24	71	51	75
Thick (>10 mm.)	0	0	2	6	3	9	8	12
Lip Profile								
Flanged	3	11	2	6	3	9	6	9
Rounded	19	70	25	69	9	26	26	38
Squared	2	7	4	11	20	59	31	46
Tapered	3	11	5	14	2	6	5	7
Amount of Rim Flare*								
Shallow (0-25°)	2	15	3	20	7	58	15	54
Pronounced (>25°)	11	85	12	80	5	42	13	46
Rim Wall Profile								
Parallel-sided	21	78	27	75	21	62	43	63
Thickening toward lip	1	4	7	19	11	32	17	25
Thinning toward lip	5	19	2	6	2	6	8	12

* relevant only when rim sherd can be oriented

Table 18. Distribution by period of selected features of general bowls.

Orientation of Rim (0° = vertical)*	IA	IB	II	III
-10 - 10°	5	5	4	6
10 - 30°	2	4	1	3
30 - 50°	2	1		
Lip Profile				
Flanged	3	2	7	5
Rounded	14	8	11	15
Squared	2	8	10	18
Tapered		1	2	1

*relevant only when rim sherd can be oriented.

Table 19. Percentage of painted sherds by period.

		Total Number of Sherds (N)	Total Number of Painted Sherds (P)	P/N
Period	IA	2460	86	.04
	IB	2715	129	.05
	II	3363	112	.03
	III	3136	130	.04

Whether measured by the number of rim sherds or by the total number of painted sherds (Table 19), the abundance of these "trade wares" shows no significant change over time.

Plates: This minor vessel form, executed in Alameda Brown Ware, is found in all time periods and in most settlement types (Table 14). Examples are illustrated in Figures 43 F-I.

In summarizing this somewhat hurried and simplified survey of vessel shapes, we may note that a basic set of ceramic containers characterizes ceramic assemblages in all time periods and in all settlement types for which a reasonable number of rim sherds are recorded. This set is dominated by undecorated jars and bowls of local manufacture. It also includes a substantial number of imported painted bowls. Locally produced seed jars and plates complete the set.

These observations relate to issues raised earlier. Our alleged field houses and permanent habitation sites cannot be distinguished in terms of the relative frequency of various vessel shapes. If the temporary storage of farm products was one important activity conducted at field houses and if jars served as storage containers, we might expect jars to be more common in field house ceramic collections. This expectation, in fact, cannot be supported by the data. In addition, if field houses were occupied on a seasonal or short-term basis and were characterized by a more limited and specialized range of activities than were permanent habitations, we might expect imported, "fancy," and presumably more valuable painted bowls to be rarer in field house ceramic collections. Again, this argument is not supported by the facts (this lack of correlation has also been noted by Pilles - see p. 9). Whatever the different acitivities represented by our settlement types, they are not obviously reflected in our ordering of the ceramic evidence. Apparently the basic set of ceramic containers defined above is relatively independent of archeological context.

Finally, we should note that there is no evidence for a marked increase in foreign wares which might relate to major population movements into the Flagstaff area following the eruption of Sunset Crater. This is clearly the case with the common black-on-white wares but also applies to the much rarer red-on-buff materials. These few sherds - which in paste, form, and decorative style conform precisely to the Hohokam type Sacaton Red-on-buff (compare Figure 44 with Haury, 1965: Plates CXLIV, f-h; CLI, g, and Haury, 1976: Figure 11.9, d-e) - occur in period IA-IB contexts and cannot be considered a post-eruptive phenomenon.

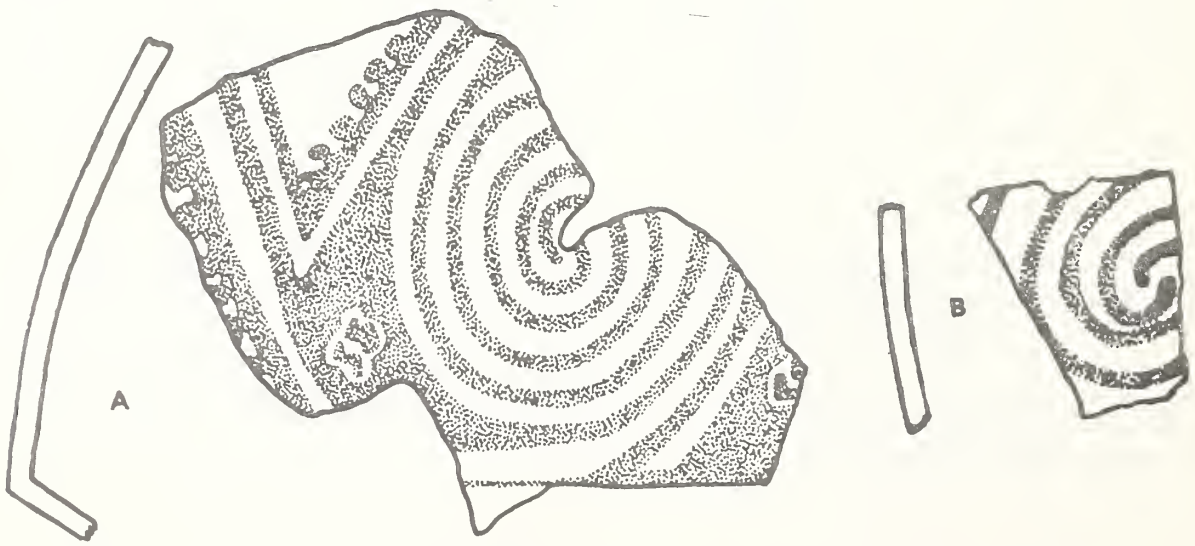


Figure 44. Sacaton Red-on-buff sherds: A. QC154-1. B. QC154-2.

Figure 45. Miscellaneous artifacts.

Figurines:	A. QC154-2, fill	
	B. QC 4	
	C. QC154-2, fill	
	D. QC154-2, fill	
Spindle whorl:	E. QC26 (Alameda Brown)	
Perforated disc:	F. QC104 (Deadmans Gray)	
Ground sherd ring:	G. QC154-2, fill (Deadmans Gray?)	
Edge-ground sherd:	H. QC94 (Angell Brown)	
Ceramic pipes:	I. QC88 (Alameda Brown)	
	J. QC154-2, fill (Angell Brown)	
	K. QC154-2, fill (Rio de Flag Brown)	
Bone awls:	L. QC154-2, fill	
	M. QC154-2, fill	
	N. QC1	
Projectile points:	O. QC154-2, floor	V. QC154-2, fill
	P. QC4	W. QC59
	Q. QC64	X. QC75
	R. QC101	Y. QC4
	S. QC154-2, fill	Z. QC154-2, fill
	T. QC154-2, fill	AA. QC62
	U. QC4	BB. QC4

Aside from the multitudinous potsherds, other ceramic artifacts recorded in the survey are few in number and can only be itemized here. Four fired clay figurines were encountered, three of these from the excavated pithouse at QC154-2. Two of the figurines have anthropomorphic torsos with applique breasts (Figure 45 A-B); one of these is constructed from two welded coils of clay, the second from a single plug of clay. Figurines of this kind have been previously reported for the Flagstaff area (Breternitz, 1959b; DeBoer, 1976: Figure 33A-B) and are also well known in other areas of the northern Southwest (e.g., Morss, 1954: Figure 19a; Barnett, 1974: Figure 56C). The two remaining figurines are zoomorphic, although their highly general rendition prevents specification of the animal(s) being represented (Figure 44C-D). Similar figurines have been reported from Flagstaff (Bliss and Ezell, 1956: Figure 92a-b) and other areas of the northern Southwest (e.g., Barnett, 1974: Figure 56A; Tanner, 1976: Figure 6.15).

Other ceramic artifacts recovered in the survey include one biconical spindle whorl from QC26 (Figure 45E), a number of perforated discs which may also have served as spindle whorls (Figure 45F), a ground sherd ring (Figure 45G), a number of edge-ground sherds (Figure 45H), and several tubular pipes (Figure 45I-K). The temporal distribution of these and other artifacts is recorded in Table 20.

Bone artifacts are rare and consist of a few awls. The three complete specimens are illustrated in Figure 45L-N.

The bulk of the lithic material collected in the survey consists of unmodified flakes, chunks, and other debitage. The raw materials used in stone working are, in order of abundance, chert, basalt, and obsidian. The chert has a cream color variously mottled with shades of red, brown, and gray. Judging by the curvature of cortical flakes, this chert comes in the form of nodules measuring 10 to 15 centimeters in maximum dimension. The source of these nodules is unknown, although they could very well derive from limestone deposits which outcrop at the base of Elden Mountain. Like chert, the basalt used in knapping comes in the form of nodules having a patinated exterior and ranging from about 10 to 15 centimeters in diameter. This basalt is fine-grained and black to dark gray in color; it differs from the basalt and dacite cobbles which are strewn over the survey area and which were customarily used for construction purposes. The source of the worked basalt is unknown. The third major knapping material is obsidian. Several obsidian sources have been mapped and described for the Flagstaff area, and Jack (1971) has noted that one of these sources - the Government Mountain source situated about 20 miles northwest of the survey area - was widely exploited by the prehistoric Sinagua.

The site-by-site frequency of these three major classes of raw material and their distribution by period and by quadrant are given in Tables 21 and 22. In Table 23, the relative frequency of lithics and sherds is given for the various settlement types. Two points of interest emerge from this table. First is the relative paucity of obsidian and basalt materials in sites which have been interpreted as field houses. The second point is the generally greater representation of lithic materials relative to sherds at sites thought to represent permanent habitations. Although it is somewhat difficult to assess the significance of a ratio of sherds to lithics, it would seem that knapping was a less important activity at field house sites than at permanent habitation sites.

Table 20. Distribution of selected artifacts. Sites grouped by period. Underlined numbers indicate excavated materials.

QC Site Number	Mano	Metate	Ground stone cylinder	Perforated disc	Edge-ground sherd	Ceramic figurine	Pipe	Bone awl	Projectile point	Knife	Scraper	Denticulate
1	-	-	-	-	-	-	-	1	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-
4-Surf.	1	-	-	-	-	1	-	-	9	1	-	-
+59-61												
5	-	-	-	-	-	-	-	-	-	-	-	-
21	-	1	-	-	-	-	-	-	-	-	-	-
22	1	-	-	-	-	-	-	-	-	-	-	-
80+151	-	-	-	2	-	-	-	-	-	-	-	-
50-55	-	-	-	-	-	-	-	-	-	-	-	-
57-58	-	-	-	-	-	-	-	-	-	-	-	-
65	-	-	-	-	-	-	-	-	-	-	-	-
68-1,3,4	-	-	-	-	1	-	-	-	-	-	-	-
80	-	-	-	-	-	-	-	-	-	-	-	-
83	-	-	-	-	-	-	-	-	-	-	-	-
104	-	-	-	1	-	-	-	-	-	-	-	-
153	14	6	1	27	13	2	2	-	13	7	6	1
4-1,2,3	1	-	-	1	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	3	-	-	-
8	-	-	-	-	1	-	-	-	-	-	-	-
12-1	-	-	-	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	1	1	1	-	-	-	-	-	-	1
15	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-	-	-	-	-
46	-	-	-	-	-	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-	-	3	-	-	-
63	-	-	-	-	-	-	-	-	-	-	-	-
64	-	-	-	-	-	-	-	-	1	-	-	-
68-2	1	-	-	-	1	-	-	-	-	-	-	-
88	-	-	-	-	-	-	1	-	-	-	-	-
92	-	-	-	-	-	-	-	-	-	-	-	-
105	-	-	-	-	-	-	-	-	-	-	-	-
152	-	-	-	-	-	-	-	-	-	-	-	-
154-2	7	4	-	4	-	3	4	3	8	1	2	1
6	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11-1	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-
26	-	-	-	2	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-
39	-	-	-	1	-	-	-	-	-	-	-	-
40	-	-	-	-	-	-	-	-	-	-	-	-
41	2	2	-	-	-	-	-	-	-	-	-	-
42	-	-	-	-	1	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-	-	-	-	-	-
45	-	-	-	-	-	-	-	-	-	-	-	-
48	-	-	-	-	-	-	-	-	-	-	-	-
49	-	-	-	-	-	-	-	-	-	-	-	-
66	-	-	-	-	-	-	-	-	-	-	-	-
69	-	-	-	-	-	-	-	-	-	-	-	-
70	-	-	-	-	-	-	-	-	-	-	-	-
71	-	-	-	-	-	-	-	-	-	-	-	-
73	-	-	-	-	-	-	-	-	-	-	-	-
74	-	-	-	-	-	-	-	-	-	-	-	-
75	-	-	-	-	-	-	-	-	1	-	-	-
76	-	-	-	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	-	-	-	-	-	-	-
81	-	-	-	-	-	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-	-	-	-	-	-
85	-	-	-	-	-	-	-	-	-	-	-	-
87	-	-	-	-	-	-	-	-	-	-	-	-
89	-	-	-	-	-	-	-	-	-	-	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-
94	-	-	-	-	1	-	-	-	-	1	-	-
154-1	4	2	-	3	3	-	-	1	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-	-	-	-	-
28-29	2	-	-	-	-	-	-	-	2	-	-	-
31	3	-	-	-	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	-	-	-	-
47	-	-	-	-	-	-	-	-	1	-	-	-
84	-	-	-	-	-	-	-	-	1	-	-	-
86	-	-	-	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-	-	-	-
91	1	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-
101	2	-	-	-	-	-	-	-	1	-	-	-
102	-	-	-	-	-	-	-	-	-	-	-	-
103	1	-	-	-	-	-	-	-	-	-	-	-

Table 21. Distribution of lithic materials by site. Sites grouped according to periods. Underlined numbers indicate excavated materials.

Site #	Chert	Basalt	Obsidian
1	1	-	-
2	1	-	1
3	-	-	-
4-Surf.	78	31	(185)
+59-61			
5	-	-	-
21	6	-	1
22	13	1	-
50+151	24	3	-
52-55	7	4	3
57-58	14	9	3
65	1	-	3
68-1,3,4	10	5	-
80	4	-	1
83	3	1	-
104	10	1	1
153	321	275	195
4-1.2.3	46	31	10
7	31	3	5
8	8	1	4
12-1	15	4	-
13	7	1	-
14	44	6	1
15	-	-	-
16	4	-	1
17	2	1	-
18	2	-	-
35	-	-	-
38	9	-	3
44	2	-	-
46	3	6	2
62	24	7	(307)
63	2	-	4
64	18	12	6
68-2	5	5	-
88	1	-	-
92	1	-	-
105	3	-	-
152	3	-	-
154-2	159	76	39
6	9	7	14
10	10	1	1
11-1	-	-	-
24	1	-	-
26	26	11	3
32	-	-	-

Site #	Chert	Basalt	Obsidian
39	-	1	1
40	-	-	-
41	2	1	-
42	-	1	-
43	-	-	-
45	-	-	-
48	12	1	1
49	-	-	-
66	6	6	1
69	2	3	-
70	6	6	2
71	4	3	2
73	1	1	-
74	7	2	-
75	-	-	-
76	2	-	-
78	2	-	2
81	5	-	-
82	-	1	-
85	4	2	-
87	2	-	-
89	4	-	-
93	7	1	-
94	10	6	-
154-1	69	21	6
23	7	1	1
27	9	-	1
28-29	25	6	4
31	16	-	4
33	-	-	-
37	-	-	-
47	8	18	2
84	12	2	-
86	5	1	-
90	5	2	-
91	6	-	-
100	1	-	2
101	10	2	10
102	-	-	-
103	15	-	9

Table 22. Distribution of lithic materials by period.

	Chert		Basalt		Obsidian		
	#	%	#	%	#	%	Total
Period IA	415	45	299	32	208	23	922
IB	365	62	146	25	75	13	586
II	193	64	75	25	34	11	302
III	119	65	32	17	33	18	184

Table 23. Distribution of lithic materials by guadrant.

	Chert		Basalt		Obsidian		
	#	%	#	%	#	%	Total
Quadrant I	650	47	435	32	284	21	1369
II	94	62	41	27	17	11	152
III	225	79	38	13	21	7	284
IV	123	65	38	20	28	15	189

Table 24. Frequency of sherds and lithic materials by settlement type.

Type Site	Total Sherds (N)	Total No. of Painted Sherds (P)	P/N	Chert	Basalt	Obsidian	Total Lithics (L)	N/L
1. 	3261	98	.03	457 46%	323 32%	214 22%	994	3.3
2. 	1464	39	.03	45 63%	4 6%	23 32%	72	20.3
3. 	570	53	.09	18 40%	24 55%	2 5%	44	13.0
4. 	1798	49	.03	333 62%	140 26%	61 11%	534	3.4
5. 	1986	145	.07	107 60%	37 21%	34 19%	178	11.2
Total 1-5	9079	384	.04	960 53%	528 29%	334 18%	1822	5.0
6. 	329	12	.04	14 88%	1 6%	1 6%	16	20.6
7. 	1711	61	.04	101 77%	21 16%	9 7%	131	13.1
8. 	206	1	.00	7 54%	2 15%	4 31%	13	15.9
9. 	113	1	.01	8 100%	0	0	8	14.1
Total 6-9	2359	75	.03	130 77%	24 15%	14 8%	168	14.0

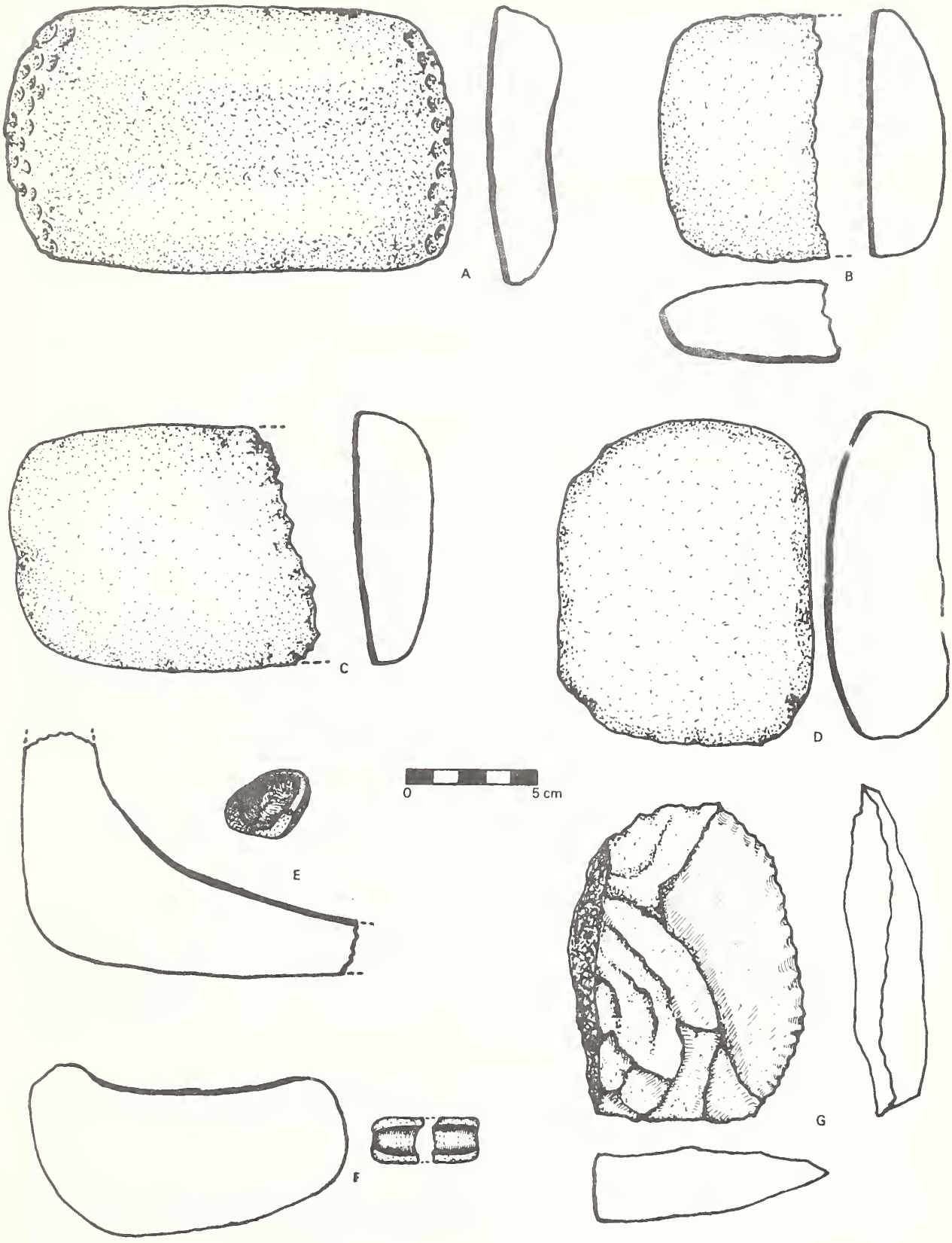


Figure 46. Manos: A. QC154-2, floor, B. QC31, C. QC154-2, fill, D. QC154-2, fill, Metates: E. QC41, F. QC41, Chert hoe: G. QC4.

Finished stone artifacts are not too common. In the chipped stone category, projectile points predominate. Complete or reconstructable specimens are illustrated in Figure 45, O-BB and in DeBoer (1976: Figure 35A-K). A nice example of a chert hoe was picked up in the middle of the clearing marking the western extremity of QC4 (Figure 46G); similar hoes have been found in other Sinagua sites, frequently at the edge of clearings which may mark ancient fields (Colton, 1932b:16). Examples of ground stone implements recovered in the survey are illustrated in Figure 46A-F. The distribution of these and other chipped and ground stone artifacts is tabulated in Table 20.

SUMMARY AND EVALUATION

> Order is a necessary condition for anything the human mind is to understand. (Arnheim, 1971:1)

Our purpose is to understand prehistoric human utilization of the Elden Mountain area. To understand is to make expectable by deriving or imposing order. At the onset of this report, a number of expectations were outlined about the order to be found in archeological data from the survey area. These expectations were based on two assumptions: (1) the prehistoric Sinagua were farmers in an area where the factors of annual precipitation and growing season length made farming a risky business; and (2) climatic changes, as manifest in changed annual precipitation or growing season length, affected the feasibility of farming in the survey area and, in turn, should be reflected in the intensity and kind of farming activity represented in the archeological record. We can now turn to an evaluation of the extent to which the archeological data presented in the last section conform to our expectations. In the following review, we shall follow the list of expectations given on pp. 11-12.

Expectation 1: During the period A.D. 925-975, the survey area was dominated by cool and wet climatic conditions inimical to farming. For this period, we expect a low density of farming settlements.

Evaluation: This expectation is somewhat difficult to evaluate as the time span in question is not adequately discriminated in our chronology. It can be noted, however, that such pre-A.D. 950 ceramic types as Kana-a Black-on-white and Floyd Black-on-gray are extremely rare in our period IA collections, suggesting a very light occupation during the early tenth century.

Expectation 2: During the period A.D. 975-1100, dry and warm conditions favored occupation of the survey area. For this period, permanent habitation sites can be expected.

Evaluation: The time span in question is covered by our periods IA (A.D. 950-1050) and IB (A.D. 1050-1100). The evidence for each of these periods is patterned somewhat differently and requires separate discussion.

Eight of the 17 sites assigned to period IA are associated with structures. Of these 8 sites, 4 are villages with 3 or more structures, 2 are isolated homesteads, and 2 are field houses. In all, 6 of 8 sites with structures are interpreted to represent permanent habitations. Expressed in other ways, of 21 period IA structures, 17 or about 80 percent occur in villages (Table 25), and the average floor area per settlement with structures is about 100 square meters (Figure 47).

The 4 period IA villages are about equally spaced around the base of Elden Mountain (see Figure 12). Settlements other than villages, however, display a more clustered distribution. They are concentrated in the first or westernmost quadrant of the survey area, particularly in the vicinity of Elden Spring; a smaller number of these sites occur in the third and fourth quadrants in the northern part of the survey area (Table 28). Each of these two site clusters is associated with a single "extra-large" structure having a floor area in excess of 100 square meters. This distribution suggests that these "communal" structures, in fact, operated in an intercommunity context.

In general, the survey data for period IA support our expectations. During this time, the survey area was dotted with a few farming villages and isolated homesteads, probably occupied on a permanent basis. Field houses were rare but, as we shall see, become more common in subsequent periods.

The settlement data for period IB suggests a pattern intermediate between that of period IA, dominated by village sites, and that of period II, dominated by field houses. Seventeen of 22 sites assigned to period IB have structures. Of these 17 sites, only 2 are villages, 5 are isolated homesteads, 7 are field houses, and 3 consist of isolated granaries. In all, 7 of 17 sites with structures are interpreted to represent permanent habitations. Of 20 structures (excluding granaries) recorded for period IB, 8 or 40 percent occur in villages, and the average floor area per settlement with structures is about 35 square meters. Both of these indices are significantly reduced in value from period IA.

There is a decided shift in the distribution of settlements during period IB. While period IA sites are most numerous in the first quadrant of the survey area, IB sites are most numerous in the second quadrant. This shift is part of a long-term distributional trend in which the area of greatest site concentration sweeps counterclockwise around the base of Elden Mountain (Table 28). There are at least two factors which may account for this pattern.

On the one hand, the change in settlement distribution can be attributed to the depletion of soil nutrients in fields and a resultant diminution in agricultural productivity. Citing the work of Schinzel, Patton, and Meurisse (1972) and observations made by Robert Schinzel, Pilles (1977a:3) notes that the soils on the flanks of Elden Mountain are low in organic content and generally ill-suited for sustained farming. This appraisal, however, is not yet fully supported by detailed soil tests interpretable in terms of the nutrient requirements of specific cultigens, and, without such tests, this edaphic hypothesis cannot be properly evaluated. Even if valid, however, soil exhaustion and its imputed role in the movement of farm sites would not account for the specific directional trend in settlement location observed in the survey data.

Table 25. Number of sites, structures, and rooms and the floor area in square meters per period. Tabulations are based on model 1 in which Elden Pueblo is assigned to period III.

		IA	IB	II	III	TOTAL
SITES	total number of sites with structures	8	14	27	14	63
	number of sites with a single room	4	12	21	7	44
	number of sites with two rooms	0	0	5	2	7
	number of sites with three or more rooms	4	2	1	5	12
STRUCTURES	total number of structures (excluding granaries)	21	20	31	23	95
	number of structures in sites with a single structure	4	12	23	11	50
	number of structures in sites with two structures	0	0	8	2	10
	number of structures in sites with three or more structures	17	8	0	10	35
ROOMS	total number of rooms	21	20	34	89	164
	number of rooms in sites with a single room	4	12	21	7	44
	number of rooms in sites with two rooms	0	0	10	4	14
	number of rooms in sites with three or more rooms	17	8	3	78	106
FLOOR AREA	total floor area in square meters	802.7	475.6	797.4	1528.2	3603.9
	floor area of all rooms in sites with a single room	206.5	261.9	492.8	74.8	1036.0
	floor area of all rooms in sites with two rooms	0	0	254.6	113.6	368.2
	floor area of all rooms in sites with three or more rooms	596.2	213.7	50.0	1339.8	2199.7

Table 26. Number of sites, structures, and rooms and the floor area in square meters per period. Tabulations are based on model 2 in which the occupation of Elden Pueblo is divided evenly between periods II and III.

		IA	IB	II	III	TOTAL
SITES	total number of sites with structures	8	14	28	14	64
	number of sites with a single room	4	12	21	7	44
	number of sites with two rooms	0	0	5	2	7
	number of sites with three or more rooms	4	2	2	5	13
STRUCTURES	total number of structures (excluding granaries)	21	20	32	23	96
	number of structures in sites with a single structure	4	12	24	11	51
	number of structures in sites with two structures	0	0	8	2	10
	number of structures in sites with three or more structures	17	8	0	10	35
ROOMS	total number of rooms	21	20	59	64	164
	number of rooms in sites with a single room	4	12	21	7	44
	number of rooms in sites with two rooms	0	0	10	4	14
	number of rooms in sites with three or more rooms	17	8	28	53	106
FLOOR AREA	total floor area in square meters	802.7	475.6	1172.4	1153.2	3603.9
	floor area of all rooms in sites with a single room	206.5	261.9	492.8	74.8	1036.0
	floor area of all rooms in sites with two rooms	0	0	254.6	113.6	368.2
	floor area of all rooms in sites with three or more rooms	596.2	213.7	425.0	964.8	2199.7

Table 27. Number of sites, structures, and rooms and the floor area in square meters per period. Tabulations are based on model 3 in which Elden Pueblo is not included.

		IA	IB	II	III	TOTAL
SITES	total number of sites with structures	8	14	27	13	62
	number of sites with a single room	4	12	21	7	44
	number of sites with two rooms	0	0	5	2	7
	number of sites with three or more rooms	4	2	1	4	11
STRUCTURES	total number of structures (excluding granaries)	21	20	31	22	94
	number of structures in sites with a single structure	4	12	23	10	49
	number of structures in sites with two structures	0	0	8	2	10
	number of structures in sites with three or more structures	17	8	0	10	35
ROOMS	total number of rooms	21	20	34	39	114
	number of rooms in sites with a single room	4	12	21	7	44
	number of rooms in sites with two rooms	0	0	10	4	14
	number of rooms in sites with three or more rooms	17	8	3	28	56
FLOOR AREA	total floor area in square meters	802.7	475.6	797.4	778.2	2853.9
	floor area of all rooms in sites with a single room	206.5	261.9	492.8	74.8	1036.0
	floor area of all rooms in sites with two rooms	0	0	254.6	113.6	368.2
	floor area of all rooms in sites with three or more rooms	596.2	213.7	50.0	589.8	1449.7

Table 28. Distribution of Sites by Period and Quadrants of Equal Area Proceeding Counterclockwise Around Base of Elden Mountain.

	Period IA	Period IB	Period II	Period III
Quadrant 1	9	5	2	-
Quadrant 2	1	8	12	1
Quadrant 3	3	6	11	6
Quadrant 4	3	4	6	9

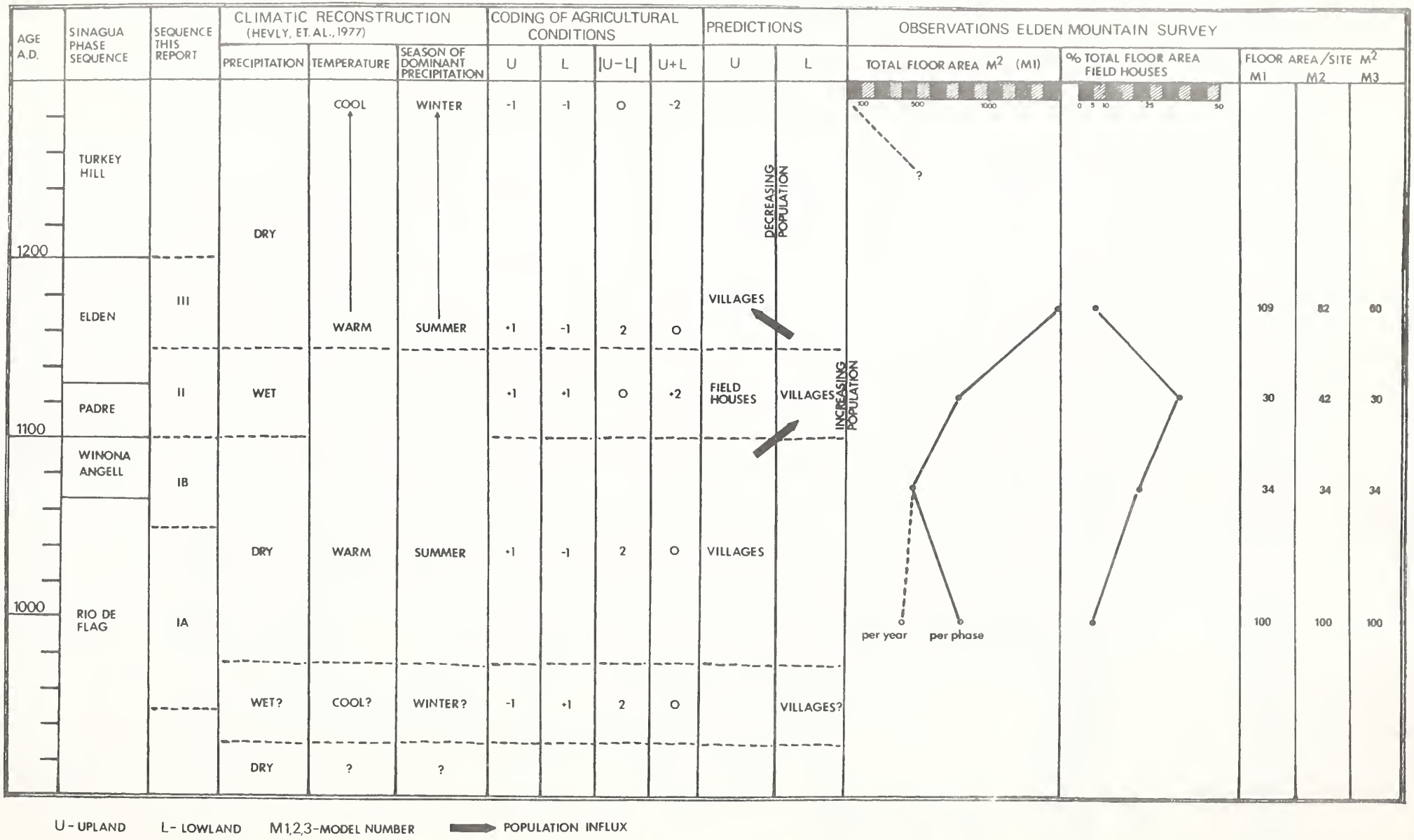


Figure 47. A chart summarizing the major arguments developed in this report. From left to right, the chart presents the cultural and climatic chronologies for the Flagstaff area, the coding of agricultural conditions and their predicted effects in upland and lowland zones, and the archeological observations made in the Elden Mountain survey.

A second factor, not necessarily independent but logically distinct from the above, requires viewing the survey area in a broader context. It should be recalled that the survey area is small and somewhat arbitrarily defined. It cannot be realistically viewed as an independent or context-less area subject only to endogenous sources of change. In this light, the counterclockwise shift in settlement distribution around the base of Elden Mountain may reflect settlement changes taking place outside the survey area. In support of this position, we can note that several large sites such as Elden Pueblo and Turkey Hill Pueblo date toward the end of our chronology and are located in or near the northern part of the survey area. This northern section of the survey area also faces the large tract of arable land in Doney Park and is also the part of the survey area most proximate to the lands affected by the ash fall of Sunset Crater.

At present, the survey data do not permit evaluation of these two proposals, although both could be readily tested given the collection of additional evidence.

Returning to the specific expectations for period IB, we should note that the increased number and proportion of field houses during this period were not predicted in our modeling of the climatic chronology. This confrontation between the model and the evidence is interesting and can be considered in several ways:

1. Our alignment of the cultural and climatic chronologies is incorrect, and additional data would bring the two into phase in a way more in keeping with the model. This, of course, is a possibility, but, at present would involve bending the evidence to favor the interpretation.

2. The shift to wetter conditions, clearly manifest in the pollen record by A.D. 1100, was actually well underway earlier, (i.e., during period IB). If this were so, we might expect the period IB villages to occur early within the period, while field houses would tend to concentrate late within the period. In fact, comparison of our seriation (Figure 5) with the coding of sites (Table 13) worked out earlier in this report does not support this possibility. On the other hand, this "test" may well be exceeding the resolution of our chronology.

3. The eruption of Sunset Crater in A.D. 1066 opened up new and productive farm lands by the late eleventh century resulting in a shift of permanent habitations from the immediate vicinity of Elden Mountain to areas to the north and east directly affected by the ash fall. Testing of this possibility would require extensive and systematic survey data from the relevant areas.

For now, we must rest uneasily with these alternative possibilities. They can readily be evaluated with additional archeological work. In summary, the period IA settlement data meet the expectations of our model; the period IB data, although not vitiating the model, are less conformable.

Expectation 3: During the period A.D. 400-1150, a combination of wet and warm conditions favored farming throughout the Flagstaff region. On the other hand, the upland (including the survey area) simultaneously loses its advantage over the lowland in terms of favorable conditions for farming. At this time, we can expect increased occupation of the lowland while the upland becomes increasingly reserved for secondary farms associated with field houses.

Evaluation: The time span in question corresponds to our period II. Of 31 sites assigned to this period, 27 are associated with structures. Of these, 17 are field houses, 9 are isolated homesteads of one or two rooms, while there is only a single case of multi-roomed permanent habitation. Looked at in another way, of 31 period II structures, only one or about 3 percent occur in villages, and the average floor area per settlement with structures is about 30 square meters. Even if we consider QC69, 70, 71, and 94 to be part of one dispersed pithouse village, only 19 percent of all structures occur in villages, and the average floor area per settlement rises to only 33 square meters. Both of these figures are lower than the comparable measurements for period IA or IB.

In short, it would seem that our expectations are fully met by the period II data. Field houses proliferate during this period, while permanent habitations diminish. Things may not be so simple, however, and it is necessary to introduce some additional considerations.

A major and, as yet, unstated problem plaguing the preceding discussion is the chronological placement of Elden Pueblo, by far the largest permanent habitation site in the survey area. Although initially studied over a half century ago, Elden Pueblo is unsatisfactorily dated. Colton (1946:16-17) assigned this site to the Elden phase of the local Sinagua chronology, now dated between about A.D. 1120 and 1200. In his recent review, Kelly (1970: 89) accepts a late twelfth century age for the major occupation of the site but notes that evidence for earlier construction is also present. We have handled this chronological conundrum by posting three alternative models, ranked according to their likelihood:

Model 1: the major occupation of Elden Pueblo dates to our period III; this placement is most conformable with our expectations and, furthermore, is supported by the fact that all other multi-roomed pueblos recorded in the survey date to this period; thus our preference for this model is not purely tendentious;

Model 2: the occupation of Elden Pueblo is divided evenly between our periods II and III;

Model 3: as neither of the above can be fully supported by strong chronological evidence, we ignore Elden Pueblo altogether; this is the least adequate model and is tantamount to solving a problem by pretending that it doesn't exist.

As can be seen in the right-hand columns of Figure 47 and in Tables 25 to 27, these models have significantly different effects on the settlement data for periods II and III.

Now that we've done what we can with Elden Pueblo, it's possible to return to our original expectations. Until this point, our primary focus has been on the relative frequencies of permanent habitation sites and field houses; little has been done in the way of assessing the size of the population occupying the survey area over time. For this purpose, we will use the floor area of structures as a reflection of the number of inhabitants. As seen in Table 29, the summed floor areas of both permanent habitations and field houses increase markedly from period IB to period II; the increase in field houses, however, is proportionally greater. Both of these observations are consonant with our expectations: climatic conditions during period II were favorable for farming throughout the Flagstaff region (reflected in overall population increase), but were relatively less favorable in the upland zone (reflected in the proportional decrease in permanent habitation).

Table 29. Floor Area in Square Meters of Permanent Habitations (PH) and Field Houses (FH), Per Period and According to Various Models

Period	Model 1		Model 2		Model 3	
	PH	FH	PH	FH	PH	FH
IA	767(96%)	36(4%)	767(96%)	36(4%)	767(96%)	36(4%)
IB	365(77%)	111(23%)	365(77%)	111(23%)	365(77%)	111(23%)
II	523(66%)	275(34%)	898(77%)	275(23%)	523(66%)	275(34%)
III	1453(95%)	75(5%)	1078(94%)	75(6%)	703(90%)	75(10%)

As previously shown in Figure 12, the distribution of permanent habitations and field houses during period II is structured in an interesting way. Permanent habitations are concentrated in the second quadrant of the survey area, where they apparently represent a continuation of the major focus of settlement during period IB. Field houses, in contrast, cluster in the third and fourth quadrants. In model 1 terms, this northern concentration of field houses anticipated the location of Elden Pueblo during the subsequent period III. It is possible that these field houses acted as pioneer settlements which later, under climatic conditions favoring occupation of the upland, were converted into permanent habitations. In the less likely scenario of model 2, however, these field houses would represent outlying farms located only a short distance, in some cases only a few hundred meters from Elden Pueblo.

Expectation 4: Period II coincides with the aftermath of the eruption of Sunset Crater. Any population influx into the Flagstaff region in order to capitalize on the beneficial effects of the eruption should be reflected in a rather sudden and dramatic increase in the cultural diversity manifest in the archeological record.

Evaluation: Potsherds are the only artifacts abundant enough to evaluate this expectation. As alluded to earlier, there is no evidence for an increase in foreign "trade" wares during period II (Table 19). Exotic painted pottery constitutes 3 to 5 percent of the ceramics from all periods. The relative stability in the abundance of painted wares also pertains to their diversity as measured by the information statistic (Shannon and Weaver, 1964), a standard measure for diversity widely employed in the ecological literature (e.g., Emlen, 1973:385):

Period	Value of H'
IA	.558
IB	.700
II	.649
III	.817

where $H' = \sum_{i=1}^{s} p_i \log P_i$ and where p = percentage representation of a painted ceramic type in relation to all painted ceramics; values of H' range from 0 (minimal diversity) to 1.17 (maximal diversity)

It can be argued that the above discussion of the abundance and diversity of foreign ceramics fails as a test of the effects of the Sunset Crater eruption as the survey area was not directly affected by the ash fall. This criticism is perfectly valid and can only be answered by calling for the collection of the appropriate data from the relevant areas. From the standpoint of the survey area, there is no need to invoke volcanic activity in accounting for the observed patterns in the archeological record.

Expectation 5: A return to dryer conditions at about A.D. 1150 again favored occupation of the survey area on a permanent basis.

Evaluation: This expectation is supported by the data. Of 16 sites assigned to period III, 14 are associated with structures. Of these, 6 are villages, one is an isolated homestead of two rooms, while 7 are field houses. Most of the villages in this period are multi-roomed pueblos. Expressed in terms of room counts, 82 of 89 total rooms occur in permanent habitations. In this light, field houses are truly a minor part of the period III settlement system.

Expectation 6: The onset of a drying and cooling trend at about A.D. 1150 increasingly discouraged farming in the Flagstaff region and should be reflected in decreasing population. During this time, we might also expect increasing signs of stress such as the amplified use of field houses or the appearance of defensive sites.

Evaluation: This is a complicated proposition to evaluate and must be broken down into several component parts.

First we may note that none of the occupations (aside from obvious historic occupations) recorded in the survey definitely extends past A.D. 1200. Virtual abandonment of the survey area by A.D. 1200 is quite possible, by A.D. 1300 almost certain. This observation is not novel. That the Sinagua abandoned the Flagstaff vicinity during the thirteenth century for the well-watered areas to the south bordering the Mogollon Rim or to the west along the Verde River has long been cited in textbook summaries of Southwestern prehistory (e.g., McGregor, 1965:419). This withdrawal must have been a rather rapid and dramatic process for, as indicated in Table 29, the survey data indicate that the local Sinagua population reached its maximum size during period III, i.e., during the late twelfth century. Regional population growth, promoted by the favorable climatic conditions of the early twelfth century, coupled with the onset of progressively deteriorating climatic conditions during the late twelfth century would seem to be two of the major ingredients setting the stage for the Sinagua exodus from the Flagstaff region in the thirteenth century.

Although we will not attempt to offer a complete explanation for the abandonment of the Flagstaff region (such an explanation would presumably have to be placed in the context of the major population relocations which were occurring throughout the Southwest during the thirteenth century), we can note some of the conditions which presaged abondonment of the survey area. As mentioned above, the local population reached its maximum size during period III. Furthermore, according to model 1 in which Elden Pueblo is assigned to period III, this population was more aggregated than during preceding periods (Figure 47).

The seeming trend toward population aggregation during period III deserves a few remarks. Several explanations have been offered for this phenomenon, some specifically geared to the Flagstaff case, others more generally applicable to the Southwest at large. Among these are included: (1) diffusion of the pueblo concept from the Anasazi (a non-explanation which either involves a mysterious "architectural imperative" or else shifts the explanatory burden to other areas); (2) defensive considerations; (3) the need for larger, coresident labor forces, most popularly related to the construction and maintenance of water-control systems (e.g., Jorde, 1977).

Excluding consideration of the first of the above three explanations, we can quickly cover the somewhat skimpy evidence that the survey provides for an evaluation of the remaining two. The period III data can be viewed in a way suggesting that defense was one consideration in the placement of some settlements. Four of the latest sites recorded in the survey (QC31, 101, 102, 103 - comprising 22 of 89 period III rooms) are pueblos situated atop steep-sided promontories which are difficult of access and distant from farm land and water sources. If defense were not a factor, the placement of these sites would appear to be purely paranoid.

When we approach the matter of labor needs, we are on shaky ground, and the relevant evidence is exiguous. Aside from the perfect tautology that more labor was needed in order to construct bigger sites, we can note that the

only water-control devices recorded in the survey are check dams, and that these are relatively modest affairs involving the spanning of a gully with a few stones. Furthermore, as given in Table 30, these check dams are fairly evenly distributed over time.

Table 30. Distribution of check dams over time.

QC Site #	Site Type	Period	No. Check Dams
4-Surf. +59-61	village	IA	3
22	surface scatter	IA	1
153	village	IA	2?
154	surface scatter	?	2?
26	surface scatter	II	5
28	village	III	3?

Check dams would appear to have been minor adjuncts to Sinagua farming which were useful in forming small arable terraces of land in the numerous gullies which descend the flanks of Elden Mountain. They do not represent major labor investments, nor do they concentrate in period III. It is possible that many check dams have been destroyed over time and that, as a result, they are under-represented in the archeological record. This possibility does not seem all that likely given that sites such as QC88, although situated in a gully bottom, are still remarkably intact after the passage of a millennium. The only evidence from the survey for gully erosion during the Sinagua occupation is the so-called gully border from QC59. The general impression, however, is one of incredible landscape stability over the past thousand years.

More acceptable candidates for projects requiring large labor forces are the ridged field systems recently recorded for the lowland zone between Elden Mountain and Sunset Crater (Schaber and Gumerman, 1969; Berlin, et al., 1977). These systems consist of alternating rows of excavated swales and mounded ridges which resemble sections of corrugated cardboard when viewed from the air. Although their age is not definitely determined, a twelfth century placement seems likely on the basis of ceramic associations. The system described by Berlin occurs at an elevation of about 5400 feet and covers an area of about 270 by 70 meters. Depending on the original depth of the swales, the construction of this field system would require the movement of anywhere between 2500 and 5000 cubic meters

of soil. This is a considerable amount of dirt, but at a seemingly modest rate of 2 cubic meters/man-day, 25 persons could readily carry out such a project in 100 days. Furthermore, recruitment of even such a small labor force would not necessarily require coresidence, but could also be accomplished through cooperation among several settlements. If further discoveries suggest that such field systems were a primary farming strategy in the lowland zone, then the case relating labor needs and population aggregation can be considered anew. At present, this case cannot be strongly supported.

Finally, we may turn to the somewhat meager evidence which the survey yields in relation to hunting activities. Projectile points - to the extent that they are primarily hunting weapons - might serve as an index of the importance of hunting; however, they are too rare in the surface collections to be useful for this purpose. Faunal remains are not preserved on the surface; the few identifiable bones from excavated contexts indicate only that the Sinagua hunted such game as antelope and mule deer (appendix I, this report; DeBoer, 1976: appendix I). Only two sites (QC62, 65) appear to represent hunting camps and serve to indicate that such camps are part of Sinagua settlement systems. In general, however, the archeological record for hunting is unimpressive and, at face value, suggests that game was a minor and occasional component of Sinagua diet.

In summary, a simple climatic model appears adequate to the task of accounting for much of the settlement data recorded for the flanks of Elden Mountain. Many problems, of course, remain, and our understanding of Sinagua prehistory, far from being complete, is just beginning.

APPENDIX I

1977 Excavations at NA11553 (QC154-2)

NA11554 (Museum of Northern Arizona site number), or QC154 (Queens College site number), consists of an extensive tract of sloping land extending from Pipeline Road on the north to Linda Vista Drive on the south (Figure 48). Artifact densities are extremely light over most of the site, but increase notably in two "hot spots," each marked by the presence of a pithouse structure. Pithouse 1, a rectangloid structure assignable to period II, was excavated during the 1974 field season and has been reported upon elsewhere (DeBoer and Billeck, 1976). Here we will briefly comment on the 1977 work at the site.

A top priority during 1977 was the completion of a good site map, a somewhat difficult task given the dense tangle of cliffrose which covers much of the site. The map was facilitated by concentrating on the network of gullies and trails which cross the area (the trails carry a daily traffic of dog-walkers, playing kids, and moped devotees from the housing development bordering the site on the south). This network provides a convenient format for subdividing the site into sections, as shown in Figure 48. Each section was subjected to an intensive surface survey in which we attempted to pick up all artifactual remains. These remains consist of sherds and lithic material.

The map of QC154 is itself useful for addressing a couple of interesting questions concerning the survey. First it serves to distinguish the artifact densities marking pithouses from the much lower densities occurring in the peripheries of these residences. Secondly it permits checking the extent to which the densities of potsherds and lithic material (the latter consisting of chunks and flakes of chert, basalt, and obsidian) are spatially concordant. The densities of these two classes of material per section are, in fact, quite closely related ($r = .77$, $p < .01$); this relationship supports the supposition followed throughout the survey that this lithic debris is entirely artifactual in nature.

Although pithouse 1 was clearly marked on the surface by a cobble alignment and associated midden, pithouse 2 was less clearly evident. The only clues to its presence were the density of surface sherds and the exposure of a midden in the gully immediately to the southwest of the structure. This circumstance is relevant to the survey at large as it suggests that many of our surface sites without visible architecture actually mark buried structures.

Pithouse 2 is a squarish structure, the rim of which is only partially bordered by basalt and dacite cobbles (Figure 49). The floor is a packed but somewhat uneven surface occurring about 60 centimeters beneath the present ground level. The fill of the structure is a gray-brown loam which is uniformly rich in cultural materials and which shows no sign of internal stratification. The south wall of the structure is marked by a U-shaped ventilator. A patch of fire-reddened earth, probably the remains of a

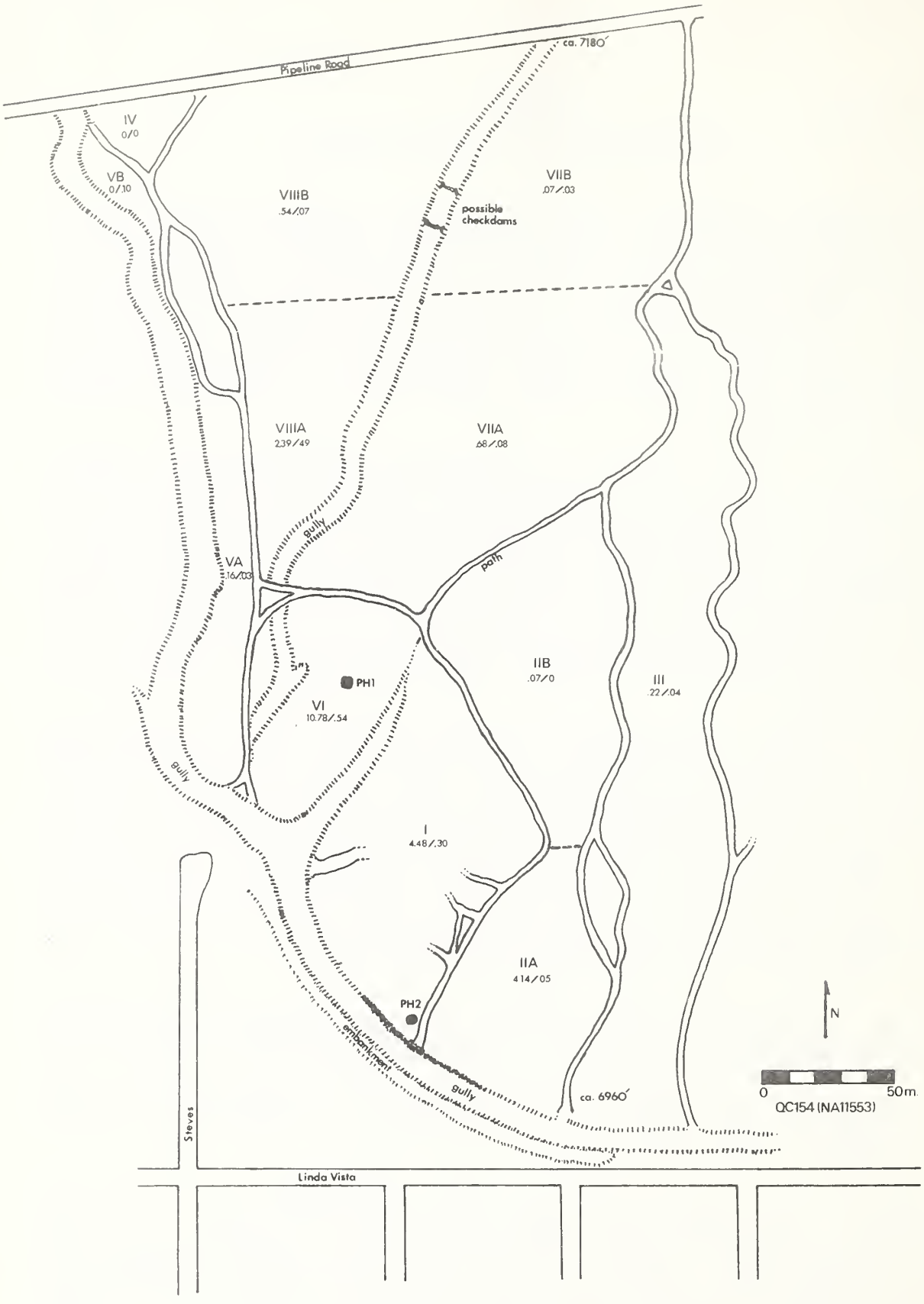


Figure 48. Site map of QC154; Roman numerals indicate site sections determined by gullies and modern trails; numbers indicate chert and lithic densities respectively, per 10 square meters.

fireplace, occurs off-center. A somewhat peculiar arrangement of four postholes was found on the floor; no postholes were encountered outside the edge of the pit. Floor-associated artifacts are piece-plotted in Figure 49.

Both the fill and floor-associated sherds from pithouse 2 indicate a period IB assignment (Table 31). The size of the structure and its associated midden suggest an isolated homestead in our settlement typology.

Table 31. Typological Composition of Ceramics

From QC154-2

Ceramic Type	Floor		Fill		Surface		Total	
	#	%	#	%	#	%	#	%
Rio de Flag Brown	42	9	865	33	82	24	989	29
Angell Brown	356	75	1392	54	220	65	1968	58
Winona Brown	-	-	3	x	4	1	7	x
Sunset Brown	-	-	1	x	-	-	1	x
Sunset Red	-	-	-	-	1	x	1	x
Youngs Brown	1	x	3	x	-	-	4	x
Unidentified Alameda	-	-	-	-	1	x	1	x
Deadmans Gray	3	1	34	1	14	4	51	1
Deadmans Fugitive Red	6	1	58	2	-	-	64	1
Deadmans Black/Gray	1	x	7	x	-	-	8	x
Tusayan Corrugated	44	9	35	1	-	-	79	2
Unidentified Tusayan Gray	8	2	129	5	7	2	144	4
Deadmans Black/Red	1	x	4	x	3	1	8	x
Unidentified San Juan Red	4	1	5	x	1	x	10	x
Kana-a Black/White	1	x	3	x	-	-	4	x
Black Mesa Black/White	3	1	17	1	2	1	22	1
Unidentified White Ware	1	x	37	1	4	1	42	1
Wingfield Plain	-	-	6	x	-	-	6	x
Red/Buff	1	x	-	-	1	x	2	x

Faunal remains are exceedingly scarce at QC154-2. Of 11 bones found in the fill of pithouse 2, only 4 can be identified as to element and taxon. These include a basioccipital fragment and metatarsal from Antilocapra sp. (antelope), a metacarpal from Odocoileus sp. (probably mule deer), and an incomplete mandible from Mustela sp. (Marian Mahler of the CUNY Graduate Program in Anthropology kindly provided the above identifications which were based on the examination of comparative collections housed at the American Museum of Natural History in New York City.)

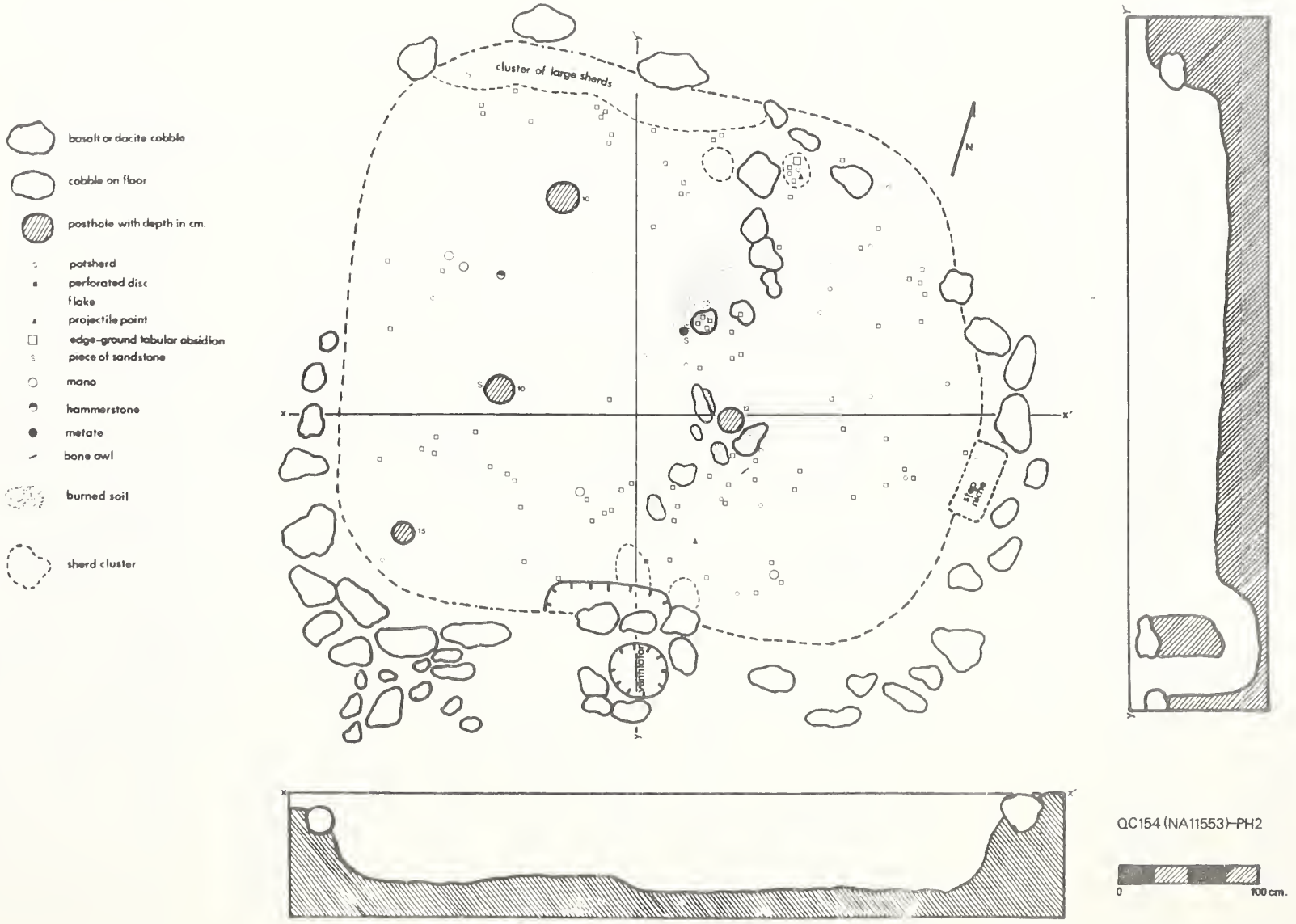


Figure 49. QC154 - pithouse 2; plan, profiles, and piece-plot of floor associated items.

APPENDIX II

Notes on a New Ceramic Variety from QC79

At the beginning of the 1977 field season, while attempting to demarcate on the ground the northern limits of the survey area, Marie Veale stumbled across an extensive sherd scatter located in the NE¼ of the SW¼ of section 28, T22N, R8E of the Sunset Crater West quadrangle. This site, eventually designated QC79, covers a large area of about 70 by 40 meters straddling both sides of a prominent gully; sherds are quite densely strewn over the entire area. Although this site falls outside the area intensively surveyed in 1977, a small sherd collection was made. This collection, tabulated in Table 32, suggests that the major occupation of QC79 dates to late period IB or early period II. Among the sherds collected from this site are two of somewhat unusual character which warrant special comment.

The two sherds in question are illustrated in Figure 50. In terms of paste and surface finish, these sherds are fully conformable with the well-known Alameda type Winona Brown. A jar of Winona Brown is suggested by the recurved profile displayed by one of the sherds (Figure 50A). What is unusual is the bichrome painting adorning the exterior surface of these sherds. The painting is executed with somewhat fugitive red and white mineral pigments. In one case, a "ladder" design is suggested, with the color scheme reversed on either side of two vertical stripes (Figure 50A). In the more complete second case, a set of nested rectangles is evident (Figure 50B).

Table 32. Ceramic Collection from QC79.

Ceramic Type	Number	Percentage
Rio de Flag Brown	63	13
Angell Brown	235	50
Winona Brown	24	5
"Winona Polychrome"	3	1
Sunset Brown	3	1
Youngs Brown	17	4
Deadmans Gray	30	6
Deadmans Fugitive Red	6	1
Deadmans Black-on-gray	5	1
Tusayan Corrugated	28	6
Unidentified Tusayan Gray	14	3
Deadmans Black-on-red	4	1
Unidentified San Juan Red Ware	2	-
Tusayan Black-on-red	2	-
Unidentified Tsegi Orange Ware	4	1
Black Mesa Black-on-white	12	3
Dogoszhi Black-on-white	1	-
Shato Black-on-white	2	-
Unidentified Black-on-white	16	3

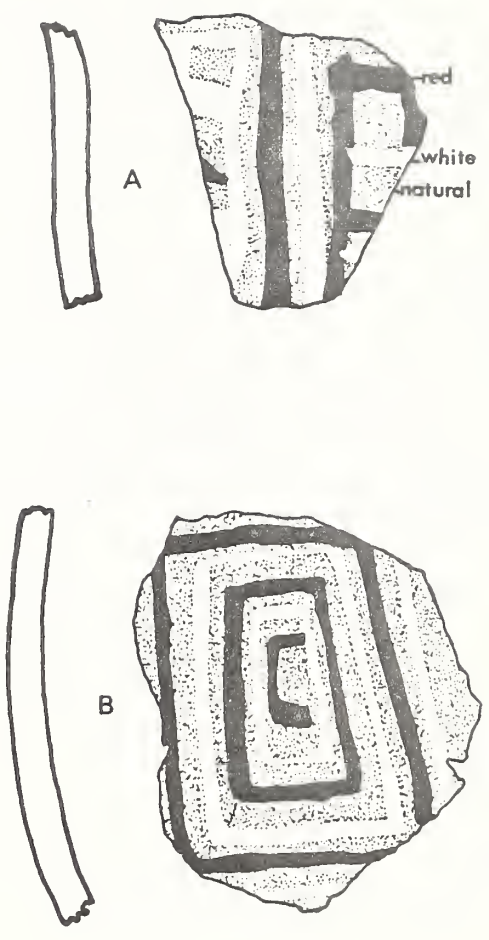


Figure 50. Winona Brown sherds from QC79 bearing red and white painted designs.

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